HOW TO GET RICH LANDS

XXI.—Lime: Its Different Forms and Which to Buy

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LIME is removed from the soil in the drainage water and in the crops. It is, therefore, plain that when the supply now in the soil is not sufficient for the best crop production it must be added to get such a highly productive soil, for no rotation, cropping or farming system adds lime to the soil. It is equally plain that unless a soil receives lime washed or drained from lime rock or other lime soils it must in time need lime, no matter how much it originally contained. Of course, soils originally very rich in lime compounds may not require applications of artificial lime for many years.

In the making of a rich soil the question is simply, does this particular soil require lime now, for the most economical production of the crops to be grown? But in the largest and best sense economical production must maintain soil fertility and in most cases in the South must increase the production of our soils.

It will be of value to give a few examples showing the amounts of calcium carbonate (calcium carbonate is 40 per cent calcium) which may be removed in given crops and also estimates of amounts which may be removed or lost by leaching.

Crops	Calcium Carbonate	
	Pounds in Crops	Pounds in Crops Removed
Corn 35 5-7 bushels.		
Grain 2,000 lbs....	1.0 lbs	1.0 lbs
Stover 3,000 lbs..	26.0 lbs	26.0 lbs
Total	27.0 lbs	27.0 lbs
Oats 40 bushels....		
Grain 1,280 lbs. .	2.0 lbs	2.0 lbs
Straw 2,000 lbs...	15.0 lbs	15.0 lbs
Total	17.0 lbs	17.0 lbs
Peanuts 50 bushels.		
Nuts 1,500 lbs....	3.0 lbs	3.0 lbs
Vines 3,000 lbs...	37.0 lbs	37.0 lbs
Total	40.0 lbs	40.0 lbs
Tobacco		
Leaves 600 lbs...	55.0 lbs	55.0 lbs
Stalks, etc.....	9.0 lbs	
Total	64.0 lbs	55.0 lbs
Cotton		
Lint 300 lbs.....	0.5 lbs	0.5 lbs
Seed 550 lbs.....	3.0 lbs	3.0 lbs
Stalks, leaves, etc.	70.0 lbs	
Totals	73.5 lbs	3.5 lbs
Alfalfa		
4 tons hay 8000 lbs	364.0 lbs	364.0 lbs

The amounts of calcium carbonate indicated would be supplied by similar amounts of ground limestone if it was pure calcium carbonate, but as ground limestone is usually only 80 to 95 per cent calcium carbonate, larger amounts are necessary to supply the amounts removed by these crops.

The amounts of calcium lost by leaching or in the drainage water depends, of course, on the rainfall and drainage and on the amount in the soil, as well as on numerous other more or less important conditions. It must be stated, however, that the losses by leaching, especially on soils well supplied with lime, are much greater than those removed in or by crops.

On soils in England, at the Rothamsted Station, to which a hundred years before, 50 tons of chalk had been applied per acre, the losses of calcium carbonate per year ranged from 564 pounds to 1185 pounds over a period of 40 years. Wheat and barley were the crops grown.

It is, therefore, apparent that the generally accepted practice or advice to apply two or three tons of ground limestone per acre every four to six years is based on a sound foundation of fact.

These losses are stated for the purpose of giving some idea of what is required to maintain the supply of calcium carbonate in a soil under cropping conditions such as those described.

But of course, there are other reasons than those of supplying plant food or maintaining the present supply of calcium carbonate in the soil, for applications of lime to our soils. A markedly sour soil will not produce maximum yields of most farm crops. It is true that plants may get the calcium required for their food needs from soils where little or no calcium carbonate exists, but they get this calcium from other calcium compounds in the soil rather than from calcium carbonate.

Different Forms in Which Lime Is Used

TO AID in remembering the three forms in which calcium is used, the following statement of the other names used to designate each of these three different forms may be of value:

1. **Oxide:** Calcium oxide, lime, burned lime, quick lime, caustic lime, stone lime, lump lime, builders' lime, shell lime, etc.
2. **Hydroxide:** Calcium hydroxide, slaked lime, water slaked lime, hydrated lime, caustic lime, etc.
3. **Carbonate:** Calcium carbonate, ground limestone, ground oyster shells, shell marl, marl, marble, chalk, shells, carbonate of lime, etc.

These three forms are not equally rich in calcium and are consequently not of equal value.

The following table shows the weights of different forms of lime which are equivalent or equal in value. For instance, it requires 1.8 pounds of ground limestone (calcium carbonate) to equal 1.3 pounds of water-slaked lime (calcium hydroxide), and 1.3 pounds of water-slaked lime to equal 1 pound of burned or quick lime (calcium oxide). This table is based on pure materials of equal purity:

Calcium Oxide Quick Lime Burned Lime	Calcium Hydroxide, Water-slaked Lime	Calcium Carbonate. Air-slaked Lime. Ground Limestone
1.0 lbs.	1.3 lbs.	1.8 lbs.
100.0 lbs.	130.0 lbs.	180.0 lbs.
500.0 lbs.	650.0 lbs.	900.0 lbs.
1,000.0 lbs.	1,300.0 lbs.	1,800.0 lbs.
1,500.0 lbs.	1,950.0 lbs.	2,700.0 lbs.
2,000.0 lbs.	2,600.0 lbs.	3,600.0 lbs.
2,500.0 lbs.	3,250.0 lbs.	4,500.0 lbs.
3,000.0 lbs.	3,900.0 lbs.	5,400.0 lbs.
3,500.0 lbs.	4,550.0 lbs.	6,300.0 lbs.
4,000.0 lbs.	5,200.0 lbs.	7,200.0 lbs.

Calcium lime is often mixed in varying proportions with magnesium lime. On most soils it is generally accepted that magnesium carbonate, while acting a little more slowly, is equally or a little more efficient in correcting acidity.

Table showing relative values per ton of the calcium compounds (lime), based on the **calcium** which they contain, when pure:

Calcium Oxide Quick Lime Burned Lime	Calcium Hydroxide, Water-slaked Lime	Calcium Carbonate. Air-slaked Lime. Ground Limestone
$2.50	$1.90	$1.40
3.00	2.30	1.70
3.50	2.65	2.00
4.00	3.05	2.25
4.50	3.40	2.55
5.00	3.80	2.80
5.50	4.20	3.10
6.00	4.55	3.40

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