

Table 2. Calcium carbonate equivalent of pure forms of liming materials

Liming materials	Neutralizing value
Calcium oxide	179
Calcium hydroxide	136
Magnesium carbonate	109
Dolomite (Calcium magnesium carbonate)	109
Calcium carbonate	100
Calcium silicate	86

Selection of liming materials

The choice of liming materials is based on the following factors

- ❖ The neutralising value which decides the efficiency
- ❖ The purity of the material - greater the purity better the efficiency to neutralise acidity
- ❖ Degree of fineness - finer the material greater the reactivity with soil

Method of lime application

The effectiveness of lime application is determined by allowing maximum contact with the soil of the applied lime. This is achieved by uniform distribution and turning over with the soil at the right moisture regime. Lime is best applied at the time of land preparation. In areas with subsoil acidity especially for perennial crops, placement to the subsoil layer will be more beneficial and effective

Kerala being in the high rainfall region is predominantly an acid soil tract. Amelioration of soil acidity has to be given top priority among the management strategies to augment crop production. The non availability of local liming material and their high cost has been a constraint, resulting in the abandoning of the liming practices earlier implemented by the Department of Agriculture. Policies and measures to provide alternate cheap sources of liming materials to farmers require serious consideration. The practice of liming should be a component of the soil fertility management strategies being popularised by the Department of Agriculture to increase production and productivity of crops.

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GOVERNMENT OF KERALA

MANAGING SOIL ACIDITY TO AUGMENT CROP PRODUCTION

How acid soils are formed

The principal factors deciding the acidic nature of soils of a region are the nature of the parent material and the climatic conditions under which the soil has been formed. The soils of Kerala have developed from acidic parent rocks under the humid tropical environment, characterised by high rainfall and temperature conditions which are conducive to rapid removal of bases from the soil. The highly weathered lateritic soils covering more than 70 per cent of the State are very strongly to moderately acid with pH ranging from 4.5 to 6.0 while the waterlogged problem areas of Kuttanad, Kole and Kaipad lands have ultra acid soils with pH less than 3.5. The predominantly acidic nature of soils of the State warrants a regular liming practice as part of the soil fertility management strategies to augment food production.

DEPARTMENT OF AGRICULTURE

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Measurement of soil acidity

The acidity or alkalinity of a soil is measured in terms of its pH. The pH scale ranges from 0 to 14, the mid point of 7 is neutral, values less than 7 is acidic and above seven denotes alkaline nature. The measurement of pH is carried out in a soil water suspension using a pH meter.

Problems in acid soils

- ❖ Toxicity of aluminium and manganese
- ❖ Deficiency of calcium and magnesium
- ❖ Decreased availability of phosphorus due to fixation
- ❖ Retards nitrogen fixation by legumes and mineralisation of organic matter
- ❖ Poor structural development in soils

Liming acid soils

Soils are limed to decrease the harmful effects of acidity. The benefits derived from liming are:

- ❖ Reduces toxicity of aluminium and manganese
- ❖ Increases availability of phosphorus
- ❖ Alleviates deficiency of calcium and magnesium if dolomite is used as the liming material
- ❖ Improves structural development and thereby air and water movement
- ❖ Stimulates microbial activity
- ❖ Improves nitrogen fixation and organic matter decomposition
- ❖ Stimulates growth and improves efficiency of bio fertilizers and bio control agents

Quantity of lime to be applied

The lime requirement of a soil is mainly based on its pH. Texture of the soil is another factor deciding the quantity of lime. For the same pH, fine textured soils require more lime as compared to soils with coarse texture.

Studies under the project on 'Soil based plant nutrient management plan for agro-ecosystems of Kerala' implemented by the Department of Agriculture have indicated that majority of the soils of Kerala are very strongly to moderately acid, requiring lime application to the extent of 250 to 450 kg ha⁻¹ depending on soil pH.

The pH classes and lime recommendation for the State are given in Table 1

Table 1. Soil pH classes and lime recommendation

pH classes	Nomenclature	pH range	Lime requirement (kg CaCO ₃ ha ⁻¹)
1	Ultra acid	< 3.5	1000
2	Extremely acid	3.5 4.4	850
3	Very strongly acid	4.5 5.0	600
4	Strongly acid	5.1 5.5	350
5	Moderately acid	5.6 6.0	250
6	Slightly acid	6.1 6.5	100
7	Neutral	6.6 7.3	-
8	Slightly alkaline	7.4 7.8	-
9	Moderately alkaline	7.9 8.4	-
10	Strongly alkaline	8.5 9.0	-
11	Very strongly alkaline	> 9.0	-

Source: Kerala Agricultural University, 2012

Liming materials

The most common liming material used in Kerala is shell lime collected from the backwaters. The availability of shell lime is fast depleting and collection is very much restricted due to environmental issues. Alternate cheap sources of lime such as calcitic or dolomitic limestone will have to be considered seriously.

Neutralising value (Calcium carbonate equivalent) of liming materials

Liming materials differ markedly in their ability to neutralise soil acidity. The effectiveness or efficiency of liming material is expressed as calcium carbonate equivalent or neutralising value. Pure calcium carbonate is taken as the standard with a value of 100 per cent. The neutralising value of common liming materials is given in Table 2. The values mentioned are for pure materials and will change depending on the purity of the material. The highest neutralising value for calcium oxide is indicative of its superiority over other liming materials in terms of efficiency to neutralise acidity.