

Liming : why and how to correct soil acidity ?

Liming consists in enriching the soil with basic products : containing calcium and magnesium, i.e positively charged molecules. The aim being to reduce the acidity in the soil (the ions responsible for soil acidity : H^+ , Al^{3+} , Fe^{2+} , Mn^{2+}).

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Technical level   



Liming a pasture © IFCE

What are the causes of soil acidity ?

Scale of acidity in farming soils (Measured by the pH of the soil)

pH<5	Very acidic
5<pH>6	Acidic
6<pH>6,6	Slightly acidic
6,6<pH>7,4	Neutral
7,4<pH>7,8	Slightly alkaline
pH>7,8	Alkaline

Optimum for
plant life
6,2<pH>6,6

There are three causes for soil acidity :

- **Mineralisation of organic matter** acidifies the soil. It is the transformation of humus and organic matter, complex elements into simple molecules which the plant can then absorb.
- **Biological activity** of plants.
- It is also the **inherent characteristic of soils which are easily washed out**, such as silt, sand, sandstone and some granites.

What are the consequences of an acidified soil ?

When the soil is too acidic, aluminium (Al) is freed into the soil, and becomes toxic to plants, thus restricting root development.

Nutritive elements such as potassium (K), phosphorous (P) and nitrogen (N) are not utilised correctly and become unavailable to the plant.

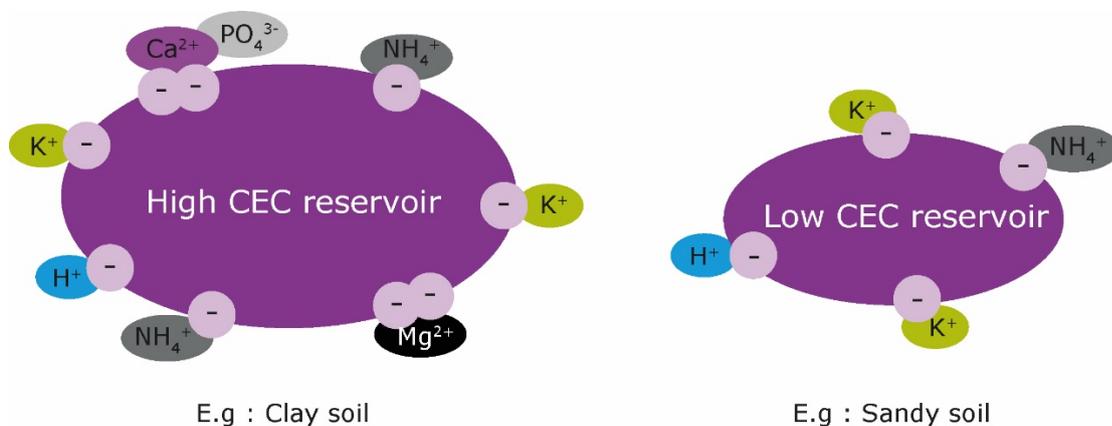
Be aware of the characteristics of each plot

Certain plants will reveal the characteristics of a plot

- Acidic soil : Moss, dock, sheep's sorrel
- Low CEC (Cation exchange capacity), low fertility: Red fescue, sweet vernal grass, agrostis, trefoil, bird's foot trefoil.

Cation Exchange Capacity (CEC)

Stems from a soil analysis, it corresponds to the capacity of clay and humus in the soil to retain all types of cations (Ca, Mg, K, Na, H, Al, Fe, Mn). CEC represents the reservoir of stored fertilising elements.

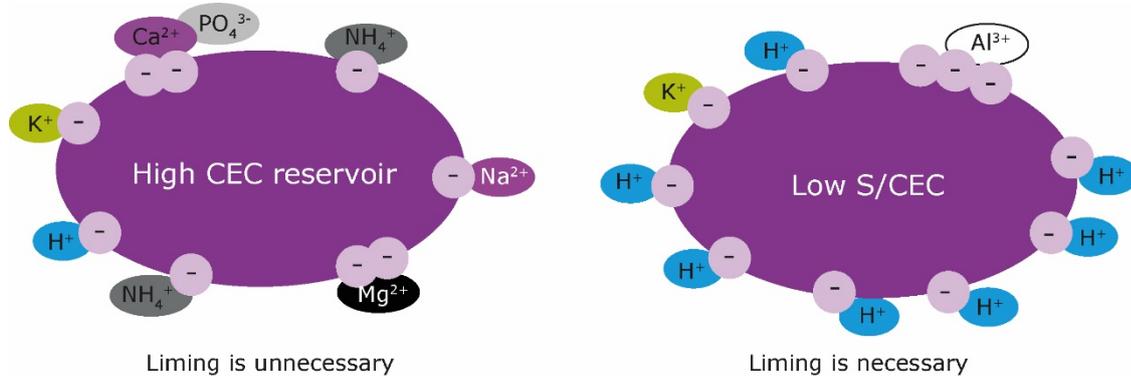


Clay soil versus sandy soil © IFCE

Saturation rate (S/CEC)

Stems from a soil analysis, it shows the occupancy rate of the CEC by nutritive cations (Ca, Mg, K, Na). It is linked to the pH. Liming is necessary when saturation point is below 80 %.

- Example 1 : S/CEC = 80%, pH = 6,2 |clay| liming is unnecessary
- Example 2 : S/CEC = 20%, pH < 5 | sandy soil | liming is necessary.



Liming necessary versus liming unnecessary

Purpose of liming

Enriching the soil with a calcic supplement

- Reduces the aluminium toxicity
- Enhances availability for the plant of the mineral elements NH₃, P, Mg and trace elements Mo, Mn, B, Zn, Cu.
- Enhances root system development, and increases calcium content of the grass.
- Improves the structural state of the soil, for soils with a low organic matter content, and a low CEC.

Two types of liming practices are used :

- **Rectifier liming**, which consists in using large quantities of lime over several years to improve a low pH. The lime spread in several small quantities so as to enhance the pH slowly, otherwise the mineral elements could be blocked.
- **Maintenance liming** which consists in supplementing the soil every 3 or 4 years to maintain a high enough pH. The quantities to be used are estimated taking into account the exports on the plot (e.g mowing) and the acidifying action of mineral fertilisers when used regularly.

On average, 350kgs/ ha of CaO can be spread every 3 years on grazing land.

Implementing liming

Calculating the quantity of CaO to rectify the pH of the soil

Calculate the dose of lime needed to rectify the soil pH		Values for CEC in cmole/kg of soil (further to a soil analysis)		
pH amendment required		5	10	15
5 to 5,5	Quantity of neutralising CaO in kg/ha to modify the pH by :	500	1000	1300
5,5 to 6		700	1300	1700
6 to 6,5		1000	1900	2800

The larger the CEC reservoir, the more CaO is required to fill the reservoir

What products should be used ?

- Burnt lime has been calcinated at a temperature of 1000°C.
- Crude non-heated products are less expensive, but their action is slower.
- The finer the grain of the product used, the more expensive it is, and the faster it will act. Quicklime is the most soluble.

Burnt lime	Crude products
Quicklime	Chalk
Hydrated lime	Marl
	Limestone
	Dolomite
	Dregs from sugar refineries or sludge from paper mills



Liming © J.M. Baradeau

Comparison of prices is established taking into account the solubility and per Ca unit.

Choosing to enrich the soil with both Ca and Mg (magnesium lime, dolomite, magnesium carbonate), should be decided after soil analysis. If the soil contains enough Mg, spreading products which do not contain Mg is much more cost-effective.

When to lime fields ?

Liming can be carried out at any time of the year, when the soil is firm enough (firm enough to carry the machinery without deterioration) :

- In summer or autumn after hay-making
- In winter, but not on snow covered ground, which would wash it out.

If using quicklime, spreading should be carried out in the absence of animals.



Be aware....

Despite empirical beliefs and studies conducted on micro-plots, there are no scientific studies to date conducted on pastures which show any efficiency of liming on destroying digestive parasites (strongyles, tapeworm.....)

Bibliography

- Arvalis, 2017. [Chaulage : une décision qui repose sur le besoin de corriger plus ou moins rapidement le pH acide du sol.](#)
- Arvalis, 2015. [La rapidité d'action du produit est un critère de choix important.](#)
- **CREMER S.**, 2015. [L'entretien des prairies.](#)
- **HUBERT F.** et **PIERRE P.**, 2004. Guide pour un diagnostic prairial - une méthode pour faire le diagnostic de vos prairies - une flore pour identifier les espèces. Chambres d'Agriculture de Mayenne et de Maine-et-Loire. 244 pages.
- **KNODEN D.**, 2007. [Le chaulage des prairies.](#)

About our writers

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