

WEBSTERS HYDRATED LIME CO LTD
641 Middle Rd P: (06) 8777617
P.O. Box 8046 F: (06) 8777509
Havelock North websters.lime@xtra.co.nz
Hawkes Bay www.whlc.co.nz



What Lime Material should I use? At least that's become the question – not “should I apply lime”

As we should all know by now, the soils on our farms and orchards develop a need for liming because growing plants to produce animal or plant products, and then removing those products from the farm or orchard, leaves a residue of acid behind in the soil. If we don't apply lime to neutralise the acidity, production will steadily decrease.

We also know that, as a good starting approximation, each stock-unit (su) removes enough plant material to leave a residue of acidity that needs 15 kg of pure limestone to neutralise it – so 10 su needs 150 kg lime/ha/year, and 20,300/ha/year, and so on.

It takes about 7.5 tones of pure limestone to make soil pH (the measure of acidity) change by 1 unit (when we are looking at soils in the 5-6 pH range), it would take around 5 years at 10su/ha, or 2.5 years at 20su/ha for the pH to go down by 1/10 (0.1) of a unit.

We can have an idea about how much lime is needed to correct the build-up of acidity, and how much we need to make pH of the soil change. What we need to answer now is “are all lime materials the same, or are there some that are better than others?”

To answer this we need a standard to compare apples with apples. For this we use pure limestone – 100% calcium carbonate. (It is important to note here that Limestone's vary greatly in quality between quarries even within close proximity, so check your local quarries latest test results to understand the qualities you are dealing with.)

All other materials are compared with this.

If liming material rates at 85, it is the equivalent of 85kg of pure limestone per 100kg of material used. A substance that rates at 120 would have the same effect as 120Kg of pure limestone per 100kg of substance applied.

Agricultural limestone (Calcium Carbonate CaCO_3) – material is quarried out of the side of a hill and ground to a top size of 2mm usually rates at 70-90% (Websters Ag lime is fertmarked to guarantee quality of between 90-95% available lime)

Burnt Lime (Calcium Oxide CaO) in its purest form rates at 175; industrial grades are usually lower at 150 to 160.

Hydrated Lime (Calcium Hydroxide CaOH_2) is formed by mixing burnt lime with water in a controlled fashion, has a liming strength of around 130 when pure; or 110 to 120 in industrial grades. Hydrated Lime reacts very rapidly in moist soil to neutralise acidity, and so can be used in intensive cropping operations, where there is only a small time between one crop and the next. If the new crop needed a higher soil pH than the previous one, Hydrated Lime could be very useful in achieving that change. A trap, though is that once it has reacted, there is nothing left to react with the acidity caused by crop growth or nitrogen fertilisers- so the pH will start to fall again as soon as the acidity is introduced into the soil.

Ordinary Limestone is by far the most widely employed product for agriculture and horticulture.

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How well does it work relating to the fineness of the grind?

While it is true that finely ground limestone will react more rapidly with the soil than coarsely ground material, the practical problems of handling very finely ground material (less than $\frac{1}{4}$ of a mm) in bulk are too great to permit its large scale use. Fine material like that would bridge and block in spreading gear and would blow away in the slightest breeze. This problem has been addressed by the industry and it is applied either in liquid fertiliser form or as a prill (Websters Fine Ground Limestone is 100um top size) this offers a fast acting solution to pH correction.

The usual standard for Ag Lime is more than 50% passing a 2mm sieve. This will give a quick lift from the finer material and provide longevity to your pH correction as the coarser material breaks down in your soil.

Material coarser than this is likely to be slower-acting, and may possibly react too slowly to give worthwhile initial lifts in soil pH and production compared to the cost of carting and applying.

In fact graphs of soil pH at different times after application of different fineness grades of lime show that the amount of acidity consumed by lime is the same in all cases. What differs is the time taken to become available to the pasture. The fine limes become available faster, the coarse limes become available slower.

Purity will guide you as to how much to apply. Most liming recommendations are given in terms of high grade limestone (90% +). Regardless of what form the limestone is in- Hydrate or Carbonate – the amount of acid consumed will be in direct proportion to the amount of pure lime-equivalent applied

Small amounts of lime, as we say above, will not have a huge impact on your pasture, while intermediate amounts 3-500kg will only affect soil conditions in the surface of your pasture.

While it could be useful when plant roots are in this layer, we need soil pH to be ideal over as deep a layer as possible, because it is important that when the soil dries out, roots can burrow deeply into the soil to find the water needed to keep pasture plants growing. This is one of the reasons why well-limed pastures stay greener for longer into a dry period than poorly limed pastures.

Where have we got?

The two measures of effectiveness for liming material are the purity and fineness of grinding. Provided that lime is ground to meet the right specifications (>50% passing a 2mm sieve) and provided it has a rating in excess of 70, it will be sufficient. Less pure forms of lime will require larger applications therefore tend to be less cost effective.

With soil needing $\frac{3}{4}$ of a tonne of lime/ha in most cases to increase soil pH by $\frac{1}{10}$ th of a pH unit, applications of less than this are little practical benefit when it comes to correcting low soil pH- we simply cannot tell if they have done anything.

Light rates, applied regularly, will help to keep the soil pH up once we have corrected any problems. The amounts are still considerable, though – even at 10su/ha, the equivalent of at least 150kg of pure limestone/yr will be needed to maintain ideal conditions for plant and animal growth.

Unfortunately, this means that there are no “shortcuts” out there. Neither Mother Nature nor inventive humans have been able to pack enough liming power into a few kilograms to correct the acid that the plants on our farms pump into the ground every year.