Lime Use in Ontario Agriculture

By Rick Rell, *CCA-ON*

Limestone is a key agronomic tool enabling farmers to balance soil pH variation and to produce high quality crops. The purpose of this article is to explain the concepts of lime application, the various lime sources available and where these materials fit for specific applications.

From an agronomist's perspective the reason for recommending limestone is to change the soil's pH to a level best suited to future cropping plans.

Other potential influences of lime application are:

- Changes in the physical, chemical and biological properties of certain soil types
- Assists in symbiotic nitrogen (N) fixation in legume type crops
- Influences the availability of certain micronutrients nutrients
- Reduces toxicities of metallic minerals such as aluminum, manganese and iron
- Enhances the effectiveness of those residual herbicides affected by low pH
- Supplies an economical source of calcium and magnesium compared with other fertilizer options

Agronomists recommend limestone based on soil testing results and also consider the long term cropping practices of the farmer. We can look at specific data for each area within a field by using GPS technology or simply by sampling different areas in the field based on soil type, slope, etc. This allows us to be fairly accurate in determining specific problem areas where variations in soil pH occur. After determining the requirements for calcium and magnesium, the type of limestone is then chosen. It can then be applied to the fields using variable rate application equipment which uses the GPS technology or it can be spread on the different zones as established by sampling.

Historically, in Ontario, about 60% of limestone sold for agricultural use is dolomitic and the remaining 40% is calcitic. In North America, testing of the agricultural land base showed that 34% of soils were below a pH level of 6.0. Twenty percent of Ontario soils are below these levels.

In Ontario, an equation, referred to as the Agricultural Index, has been developed to allow comparison of liming materials. Two factors are considered in this equation:

- the neutralizing value of the material, which is based on a comparison of calcium carbonate equivalent being 100%, and
- the particle size of the lime which is assessed a fineness rating.

Agricultural Index = (neutralizing value X fineness rating) ÷ 100

Once the agricultural (ag) index of the limestone has been calculated, we can then use this to determine the application rate for the material based on the soil test data. A standard ag index of 75 is considered suitable for Ontario liming materials. The following formula will then enable us to calculate an application rate:

> Limestone application rate from soil test X (75 ÷ agricultural index of limestone) = rate of application of limestone
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> ***Example:***
> The soil test recommends 8 tonnes/hectare and we will be using an ag index rated lime of 80. Therefore, an application rate of 7.5 tonnes per hectare is required.
> 8t/ha x (75 ÷ 80) = 7.5 t/ha

Other factors for agronomists to consider when recommending limestone applications are the cost of the limestone, transportation costs to the farm, the availability of product when it is required, and also the physical condition of the lime such as excessive moisture or dryness and also frozen lime in early spring.

Generally, limestone is always applied to the soil and worked in with tillage equipment prior to planting the crop. In some instances, where the perennial crop such as an orchard is established, the lime can only be applied to the soil surface and with subsequent rainfall and snow gradually moves downward in the soil towards the plant root system. Also, considering that limestone generally takes between one to two years to fully react with the soil, it may be necessary to treat land several years in advance of planting a high value crop.

Soil texture is also a major factor in determining both the amount of limestone to apply and also the frequency of application

Soil that is coarse textured, such as sand, will require less lime to correct acidity. This is due to the soil having a low cation exchange capacity (C.E.C.) which determines a soil's ability to retain cations (positively charged minerals) such as calcium and magnesium – major components of limestone. Although less lime may be required for each application, the frequency of applications will be more often than on soil with a higher C.E.C. such as clay. Clay soils can retain minerals for longer periods of time but generally more limestone is required to change the acidity in the soil.

Today's scientific approach to soil fertility and crop production, with emphasis on environmental sustainability are key considerations for farmers. The availability of quality liming materials will provide farmers with a cornerstone for their fertility programs and will enable agriculture to provide Canadians with a good source of domestically produced food.

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There are over 500 Certified Crop Advisers (CCA) in Ontario. Each CCA has demonstrated their knowledge about Ontario crop production by passing the required exams. In addition, they have the crop advisory experience, the education, the commitment to continuing education and have signed a comprehensive code of ethics, which places the grower's interests first.

This industry driven program helps ensure that Ontario crop producers are well served by those providing their crop production advice. This article was written by one of those CCA's.