A CHART FOR EVALUATING AGRICULTURAL LIMESTONE

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The need of a simple method for evaluating agricultural limestone on a basis of probable activity and cost of lime active over different periods after incorporation into the soil has long been recognized. A plan for evaluation, suggested by the junior author, was published by Bear and Allen (2). The basis is size composition data furnished by a complete sieve analysis. A ground limestone is considered to be made up of a number of size classes, as defined by standard sieves, of particles with known mean diameters (d) and similar average shape. Dissolution should act upon all particles alike in a given time, removing from each a shell of material uniform in thickness, and so reducing the diameters of all particles by a constant amount, a unit, up to the point of disappearance. The proportion (R) of the material in each size class which remains after the mean diameter (d) of all the particles in the size class has been reduced by a unit will be R = \(\left(\frac{d - a}{d}\right)^3\). The proportion of the weight of each size class which has been active will be 1 - R, a measure of the activity of the size class. The comparative value of any ground limestone of similar dissolution characteristics over the given time will then be the sum of the products, percentage of each size class in the limestone times a factor (1 - R) appropriate to that size class and time.

The accuracy of an evaluation based on this idea depends primarily upon knowledge of the rate of attack upon limestone in a typical acid soil under field conditions. Upon this depends the value.a, required for calculating 1 - R. Obviously, a is not to be considered an absolute value, to be observed by direct measurements on limestone particles or by similar means. It is a calculated value which can be derived from data on disappearance of carbonate after an application at a known rate of a narrowly defined size class of limestone to a representative acid soil under conditions resembling those of practical liming. In an experiment of this kind, where the mean diameter of the limestone size class used is d and R is the fraction of the carbonate applied which remains after a certain time, a = d (1 - \(\sqrt[3]{R}\)). For such experiments to furnish a value of a which will be practically useful, it is important that the rate of application be adjusted to the soil's ability to decompose limestone, the so-called lime requirement. But since there would be required a time inconveniently long to approach satisfaction of the full lime requirement by medium or coarser size classes applied at practical rates, the aim in our experiments has been to apply limestone...