

application of lime (Buckman and Brady 1969). Some of the detrimental influences of excess lime are:

1. Deficiencies of available iron, manganese, copper, or zinc may be induced.
2. Phosphate availability may decrease due to the formation of complex and insoluble calcium phosphates.
3. The absorption of phosphorus by plants and especially its metabolic use may be interfered with.
4. The uptake and utilization of boron may be hindered.
5. The drastic change in pH may, in itself, be detrimental.

### 9.3.2 Economics of Agricultural Liming

On judging the amounts of lime to apply, a number of factors should be considered: (1) cost of liming material; (2) the soil surface pH, texture and structure, and the amount of organic matter; (3) the subsoil pH, texture and structure; (4) the crops to be grown; (5) the length of the rotation; (6) the kind of lime used and its chemical composition; (7) the fineness of the limestone; and (8) operational experience.

### 9.3.3 Forest Liming

While much is known about agricultural liming practices (materials, techniques, beneficial effects, and potential problems), much less is known about liming forested ecosystems. For the boreal, north temperate and temperate forests, such as are present in northeastern North America, Scandinavia and northwestern Europe, liming has considerable tradition for many centuries (Evelyn 1776).

Where forest liming is viewed more as a fertilizer or nutritional measure, rather than as an aid to soil restoration, its promise is far less re-assuring. This is because calcium deficiencies have seldom been demonstrated and fertilizer trials embodying a calcium treatment have rarely shown a positive response by tree growth. Thus major reviews of fertilizer research for Canada (Rennie 1972), the United States (Bengtsson 1977; Mustanoja and Leaf 1965), Sweden (Holmen 1976), Great Britain (Everard 1974) and Germany (Baule and Fricker 1970), show calcium trials to be extremely few compared with those for nitrogen, potassium and phosphorus, with very few indications of positive growth responses.

Forest liming has not been widely implemented because it has not yet been shown statistically that acidic deposition has caused adverse