FACTS ABOUT LIME

Soil Acidity and Liming

Soil acidity is one of the environmental factors which can influence plant growth and seriously limit crop production. Agricultural lime will also increase the efficiency with which crops use the fertilizer applied.

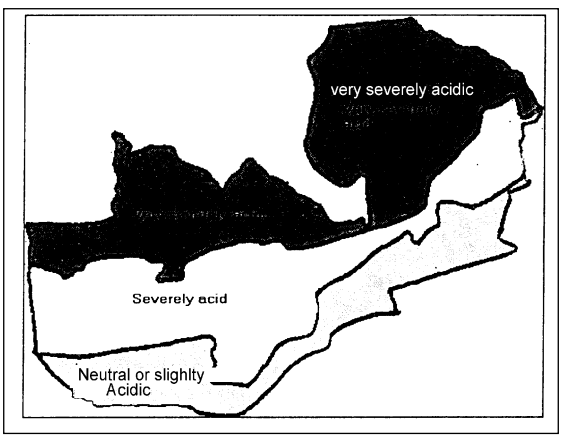
Zambia Status

Most of the soils used for crop production in Zambia need lime for optimum yield. Soil analysis results from studies done by Faculty in the Soil Science Department, University of Zambia between 1998 and 2003, revealed that although soil acidity is stronger in the upper regions of Zambia (Figure 1), it is widespread in all parts of the country and the soils will benefit from liming. The extent of the problem varies from field to field therefore the amount of lime required also varies.

Causes of Soil Acidity

Soil acidity occurs as a result of (a) acidic parent material that forms the soil, (b) high volumes of rainfall and leaching of elements like Ca, Mg and K out of the soil plow layer, (c) decay of organic matter leading to release of organic acids into the soil, (d) harvest of high yielding crop which removes plenty of Ca, Mg and K from the soil, and (e) widespread use of nitrogen fertilizers.

Figure 1. Soil acidity trends in Zambian soils



Measure of Soil Acidity:

pH is the indirect "indicator" of soil acidity." It is usually measured by suspending soil in water, but in Zambia calcium chloride solution is widely used. The scale of pH values in water ranges from 1 to 14. Soils with pH less than 7 (or, 6 in calcium chloride) are said to be acid and may require lime while those above pH 7 are alkaline and do not need liming. The lower the pH value the more acid the soil is and therefore needs more lime.

Desirable pH range for best crop performance

The tolerance of various crop species to soil acidity varies (Figure 2), but most crops will grow well in soils that range in pH from 5.5 to 7.0.

Soil pH in Water

Crop	5.0	5.5	6.0	6.5	7.0	7.5
Maize		■	■	■	■	■
Soyabeans			■	■	■	
Wheat		■	■	■	■	
Cotton			■	■	■	■
Beans			■	■	■	■
Cassava			■	■	■	■
Sorghum		■	■	■	■	
Potatoes	■	■	■	■		

Figure 2. Favorable soil pH for common crops

P. O. Box - 35192, Lusaka, Zambia. Tel: +260 211 286064/286057, Fax: +260 211 287528/287611
e-mail: infolime@uniturtle.com website: www.uniturtle.com

Why are we concerned about soil acidity?

a. Acid soils may contain harmful concentrations of aluminum and manganese that limit plant growth.
b. The solubility and availability of elements in the soil such as N, P, K, Ca, Mg, B and Mo is usually low in acid soils (Figure 3).
c. Activities of microorganisms that are needed to decompose organic matter, to convert ammonium to nitrate and to fix nitrogen is negatively affected in acid soils.
d. The effectiveness of fertilizer and some chemicals applied to the soil is reduced.
e. Crop yields are usually generally low in acid soils.

Combating Soil Acidity:

The quickest way to neutralize soil acidity is by applying agricultural limestone to the soil. A good liming program is based on a professional laboratory soil test that determines the degree of soil acidity and the correct amount of lime to use. Other options include the use of field test kits or a diagnostic chart.

What is Turtle Agri - Lime?

This is Agriculture Limestone powder that neutralizes soil acidity. There are two basic types of agricultural lime used in Zambia: **Calcitic** limestone which consists of calcium carbonatett and **dolomitic** limestone which is a mixture of both calcium and magnesium carbonates. As they neutralize soil acidity, these lime materials also add calcium and magnesium to the soil. Choice of type of lime to use depends upon the balance between calcium and magnesium levels in the soil. If the soil is low in magnesium dolomitic lime should be used.

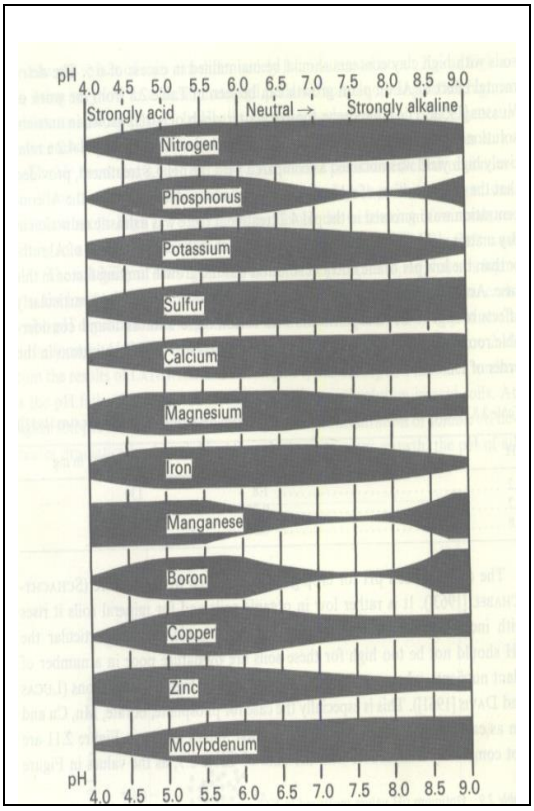


Figure 3. Effect of soil pH on nutrient availability.

Amount of Lime to Use

The goal of liming can be to raise soil pH to a specific value, or to neutralize acidity generated by soil. The first option usually requires more lime. After the extent of soil acidity is known, the quality of lime material is another important factor to arrive at the amount of lime to use.

Quality of Lime:

The primary factors that affect the quality/value of agricultural limestone are neutralizing value and fineness.

Neutralizing Value (NV) is the amount of soil acidity which the material can neutralize when it is compared to an equal amount of calcium carbonate. Calcium carbonate has been assigned a value of 100. So if for instance, 1 kg of the lime material neutralizes the same amount of soil acidity as 1 kg of calcium carbonate, the NV of that lime is 100.The higher the NV of a lime material the better it is.

Fineness of lime material determines how quickly it will react with the soil to neutralize soil acidity. The finer the material, the faster it will work as it will be more soluble and contact more soil surface area. An ideal lime material should have 90-95% material pass through 20-mesh, 50-60% through 60-mesh and 30-50% through 100-mesh. This allows for some material to react quickly while the rest provides residual reaction.

How long will it Take for Lime to React with Soil and for how long will it last?

It normally takes lime 2 to 3 years to react completely with soil. Apart from the quality of the lime, reaction time will also depend upon amount of soil acidity, soil organic matter, type and amount of clay and the cropping practices. The effect of Turtle lime can last up to 3 or 4 years, but this does not mean that it will not be necessary to apply more Turtle lime during that period. Not all acidity is neutralized at once, so regular applications of Turtle lime may be necessary. Lime should be applied well ahead of planting acid sensitive crop so that there is enough time for the reaction to begin. It is important to note that the chemical reaction of lime in the soil requires moisture.

How Should Turtle Lime be applied?

Lime does not move very much in the soil, so it should be evenly mixed in with the soil plow layer, especially the rooting volume.

Is Lime Fertilizer?

Lime works to neutralize soil acidity and make the soil environment more suitable for roots to grow in. However several studies have shown that applying lime to acid soils significantly enhances the performance of fertilizers that are used on such soils (Figure 4). This can result in significant crop yield increases and more income to the farmer.

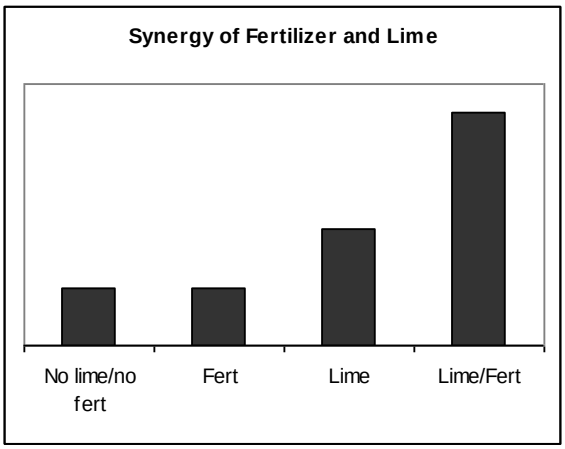


Figure 4. Effect of lime and fertilizer on yield

Benefits of liming:

1. Combats soil acidity by reducing metals toxicity, making soil PH more soluble and microbes more active.
2. Supplies Ca, Mg to plants
3. Improves soil physical structure with better water infiltration and reduced energy for roots to penetrate soil e.g Calcitic Lime best for clay soils and Dolomatic best for sandy type of Soils it help to compact the soils.
4. as well as provide Mg for Milking cattle if broadcusted in the grazing field.
5. Improves the performance of fertilizer.
6. Studies have shown that applying Turtle lime to soil can return between $5 to $25 for each $1 spent.

Turtle Lime:

Turtle lime is produced using Roller Mill method which can give the fineness (Average 150-micron) that is highly recommended for agricultural lime material. Turtle lime contains 37 % calcium and 6 % magnesium and

has a neutralizing value of 102 (Table 1) neutralizing soil acidity. This fineness of Turtle lime ensures quick neutralizing reaction of soil acidity and a lasting benefit.

In laboratory incubation study with Turtle lime,the University of Zambia reported that this material was effective in raising the pH of some acid soils within 14 days of application. In the same study, the new pH values of these soils were maintained for more than 120 days.

For easy handling and transporting convenience, Turtle lime is packaged in 50 kg bags. We maintain a stock of more than 2000 tons at all times in order to promptly respond to your requirements.

Table 1. Typical analytical data for Turtle lime

Sample	%Ca	%Mg	%NV
1	37.81	6.65	102.25
2	37.50	5.95	101.33
3	34.30	6.30	102.75

About Lime:

For Further Information:

Uniturtle Industries (Z) Ltd
Trading As
Turtle Agro-Mining
Plot 12913, Mumbwa Road,
Lusaka, Zambia
Tel: 286057/286064/286258
Fax: 287528/287611
Email: infolime@uniturtle.com

About Soil Acidity and Soil Testing:

Soil Science Department,
University of Zambia,
P.O. Box 32379, Lusaka.
Tel: 295421; soils@agric.unza.zm

-Zambia Agricultural Research Institute – Mt. Makulu, P/Bag 7 Chilanga.