

ACID SOILS AND LIMING

COMPILED BY THE NORTH WEST
REGIONAL MEDIA DIVISION OF
THE DIRECTORATE OF AGRICULTURAL
DEVELOPMENT SUPPORT SERVICES OF
THE NATIONAL DEPARTMENT OF
AGRICULTURE AND ENVIRONMENTAL AFFAIRS



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LIMING: EFFECT OF SOIL ACIDITY ON MAIZE



Problems with plant growth pH (KCl) less than 4.5

With pH less than 4.5

Acid saturation % can go from + 1% to 80 %

Good growth to Very bad growth

Vegetables

Maize - Soyabeans

PAS*. 5% and less

PAS*. 20% and less

* PAS - Permissible Acid Saturation

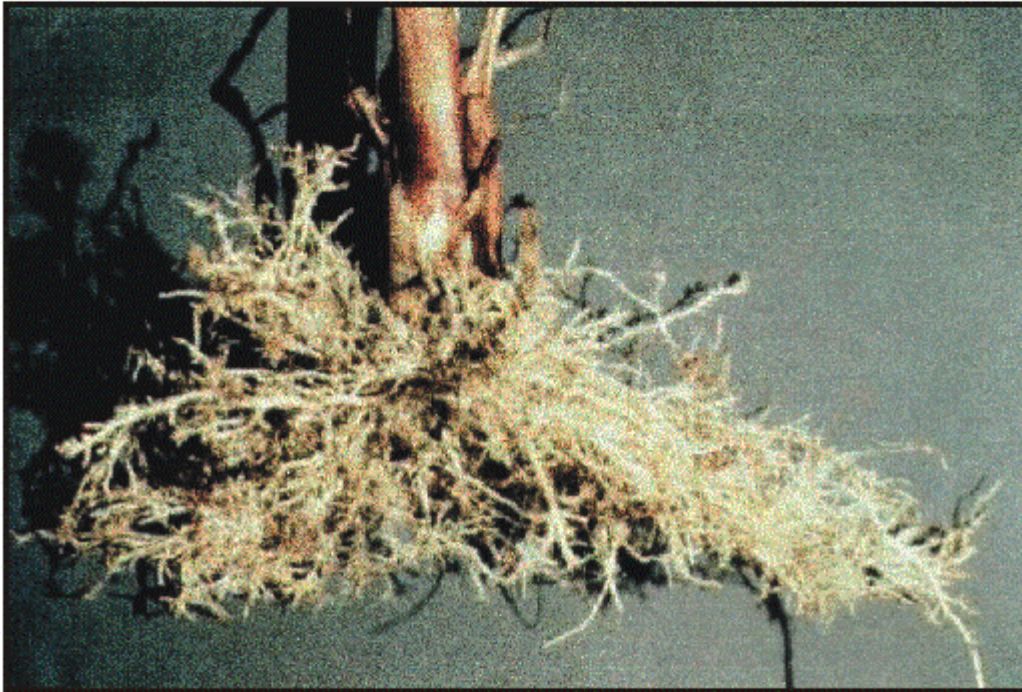
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LIMING: EFFECT OF SOIL ACIDITY ON MAIZE (part 2)



Acid soils can stunt roots



The roots cannot absorb plant foods and water effectively

This can lead to crop failure

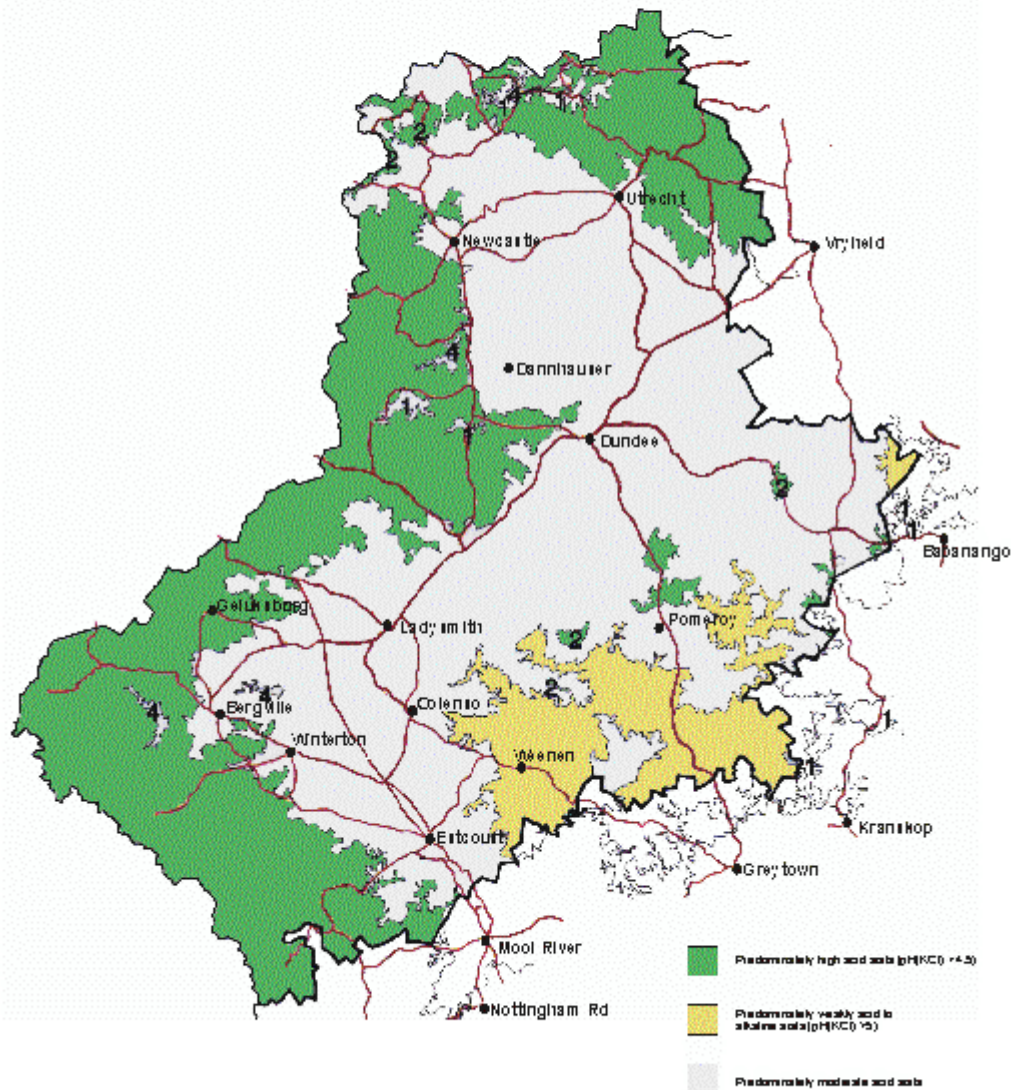
Solution: Apply lime before fertilizer

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LIMING: THE CAUSES OF SOIL ACIDITY



Distribution of Acid soils in North West Region

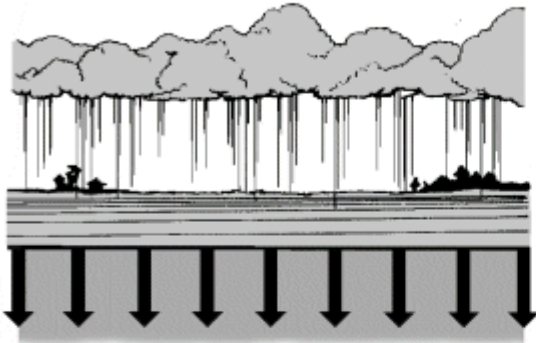


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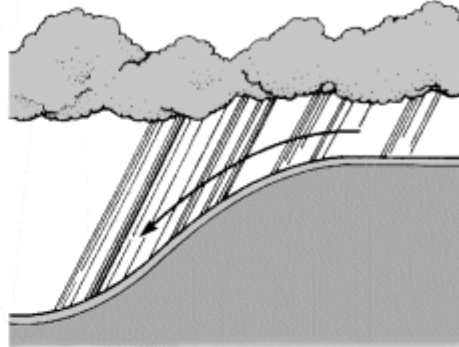
MAJOR CONTRIBUTORS TO SOIL ACIDITY



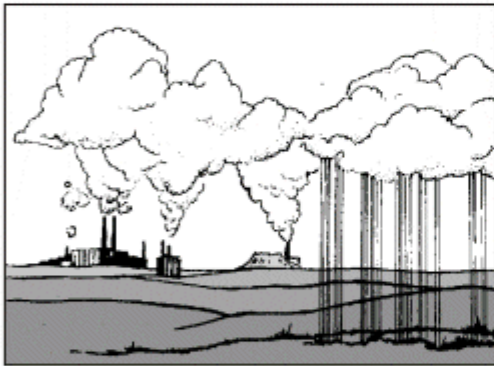
Leaching



Soil Erosion or Runoff

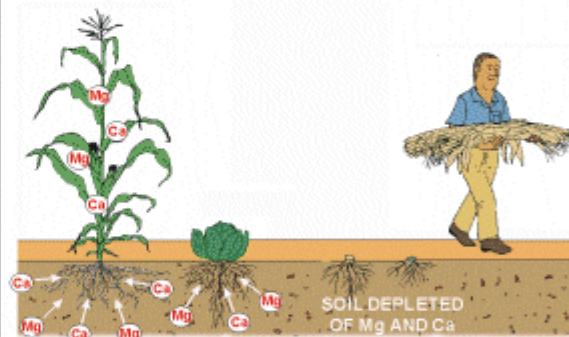


Acid Rain :



Caused by coal burning
(Home and Industry)

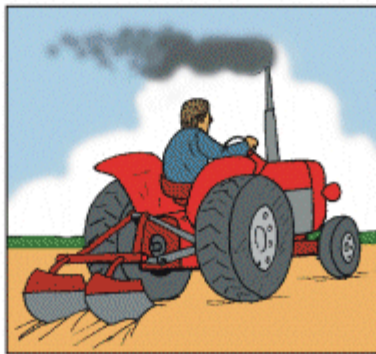
Salts Removed by Crops



Fertilizer Application :
High rates of Nitrogen
Fertilizer



Cultivation :

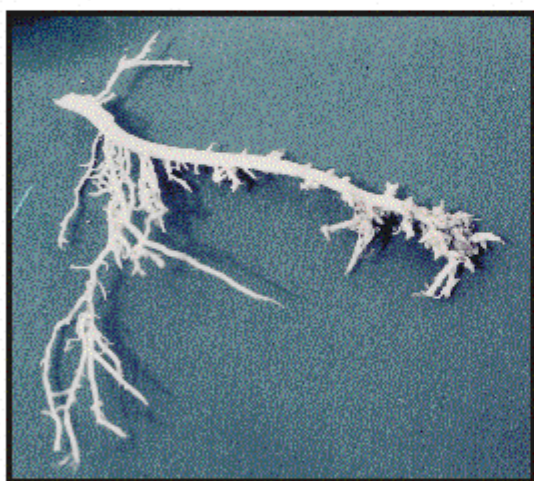


5 LIMING: CONSEQUENCES OF ACIDITY

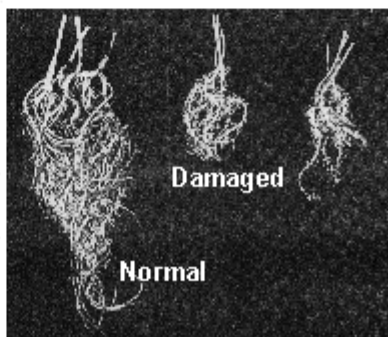


Damaged root growth

Maize root damage



The damaged roots have no fine hairroots



Soya roots :

The damaged roots cannot absorb plant foods and water effectively

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LIMING : CHEMICAL DEFICIENCIES IN CROPS

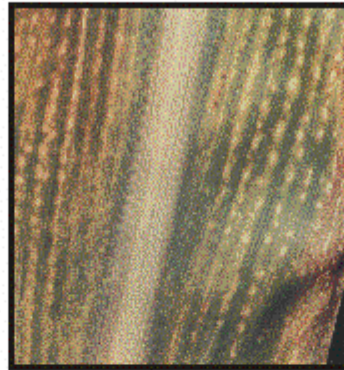


Magnesium deficiency symptoms often indicate excessive soil acidity

Symptoms of Magnesium(Mg) - deficiencies in :

Maize

Tobacco

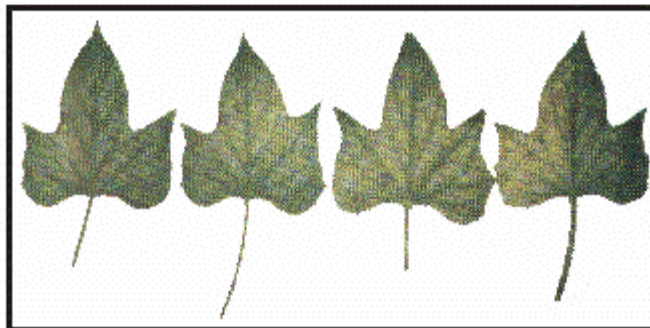


Potatoes

Tomatoes



and Sweet Potatoes



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LIMING : DEFICIENCIES (PART 2)



Phosphate and **Molybdenum** deficiencies can also occur under acid soil conditions as indicated in the following :

Phosphate deficiency
in maize



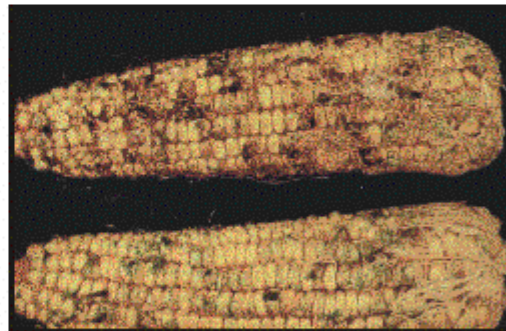
Molybdenum deficiency
in maize over a large area.



Molybdenum deficiency in maize :
In young maize plant



Premature germination of seed.



Molybdenum deficiency in Soyabeans.



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LIME : ACID SOIL AND LIMING



Poor water uptake :

Acidity in soil (low pH) leads to root damage yellowing, and wilting as a result of poor water uptake.



To solve this problem add lime. This will improve root growth resulting in green plants and an earlier crop, because of better water uptake.



Acid soil and Liming :
The effect on maize growth

Lime was applied

No Lime was applied



The Result :
Poor root systems

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REACTION TO SOIL ACID LEVELS



Soil acidity levels are given in the following table :

	Very sensitive plants	Sensitive plants	Tolerant plants	Very tolerant plants
Agronomic crops	Barley	Coffee Cotton Grain Sorghum Maize Soyabeans Sunflower Tobacco wheat+	Groundnut Oats Potato Sugar-cane*	
Annual and perennial horticultural crops	Acocado Beans Cabbage Carrots Cauliflower Citrus Lettuce Macadamia Mango Union Papaja Pea Pecan Pumpkin Spinach Sweet melon Sweet potato Tomato Walnut Water melon	Almond Apple Apricot Banana Cherry Grapevine Granadilla Guava Kiwi Litchi Olive Peach Pear Pistachio Plum Strawberry	Pineapple Raspberry	Blackberry Blueberry Roobos tea
Pastures	Clovers Lucerne Temperate Legumes	Perennial rye-grass	Italian rye-grass Lupins Tropical legumes	Couch grass Lovegrass Fescue Kikuyu Tropical grasses
PH (KCL) below which yield declines	5,2 - 4,7	4,8 - 4,5	4,6 - 4,3	4,4 - 4,0
Acid saturation (%) above which yield declines	5 - 10	10 - 20	20 - 30	30 - 40
* Judge on AL indexes (0,3 - 0,9 c/mol c/kg) only + Depending on acid tolerance of cultivar Lower values refer to sandy and organic soils; higher values to clay soils				

SUBSOIL ACIDITY



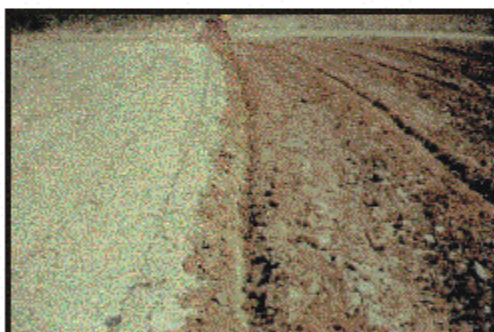
Maize roots restricted to limed topsoil

Only the topsoil received lime

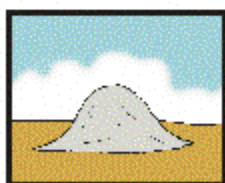
An uneven spread of lime will lead to patches of low productivity



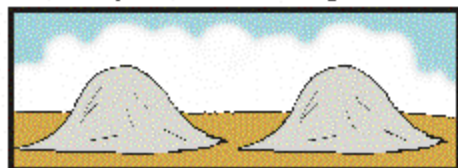
Thorough incorporation of lime is important, ensuring good root growth throughout the topsoil



The amount of lime for : Maize



and dry beans or vegetables



Lime should be spread evenly

