Not only did the ancients recognize the merits of manure, but they also observed the effect that dead bodies had on increasing the growth of crops. Archilochus made such an observation around 700 BC The increase in the fertility of land that has received the bodies of the dead has been acknowledged down through the years, but probably most poetically by Omar Khayyam, the astronomer poet of Persia, who around the end of the 11<sup>th</sup> century wrote –

The value of green manure crops, particularly legumes, was also soon recognized. Theophrastus noted that a bean crop was incorporated in the soil by the farmers of Thessaly and Macedonia. He observed that even when thickly sown and large amounts of seed were produced the crop enriched the soil. Virgil (70-19 BC) advocated the application of legumes.

Theophrastus suggested the mixing of different soils as a means of "remedying defects and adding heart to the soil". This practice may have been beneficial from several points. The addition of fertile soil to infertile soil could lead to increased fertility. The mixing of coarse-textured soils with those of fine texture, or vice versa, may have caused an improvement in the water and air relations in the soils.

Cato advised the vine keeper to burn prunings on the spot and to plow in the ashes to enrich the soil. Columella also suggested that the spreading of ashes or lime on lowland soils to destroy acidity.

Salt petre, or potassium nitrate, was mentioned both by Theophrastus and Pliny as useful for fertilizing plants and is referred to in the Bible.

Theophrastus recognized that palm trees required large quantities of salt, early farmers poured brine around the roots of their trees. Many of the early writers believed that the colour of the soil was a criterion of its fertility. The general idea was that black soils were fertile and light or gray soils infertile columella felt that such factors as structure, texture and acidity were far better guides to

## Soil and Fertilizer of Micronutrients

Quantity of super phosphate b) 16 kg P<sub>2</sub>O<sub>5</sub> remains in 100 kg of super phosphate (single) 1 kg -"-100 kg of -"-16 20 kg -"- $100 \times 20 = 125$  kg super phosphate (single) 16 Quantity of Muriate of Potash c) 60 kg Potassium remains in 100 kg of Muriate of Potash 1 kg \_"\_ in 100 \_"\_ 60 \_"\_ 100 x 20 20 kg \_"\_

60

= 33.33 kg of Muriate of Potash

Calculation of price of fertilizer

(Price of fertilizer as per G.O. date 22-04-1998)

	Amt. of fert.	Rate	Price
Urea	88.880 x	3660.00	= 325.30

## Table 9 : Rating Chart for Soil test data

SI. No.	Items	Low	Medium	High
a)	Nutrients			
i)	Organic carbon (as a measure of available nitrogen)	below 0.5%	0.5 -0.75%	above 0.75%
	or			
i)	Available nitrogen (N)	below 280 kg/ha	280-560 kg/ha	>560 kg/ha
ii)	Available Phosphorus (P)	below 10 kg/ha	10-25 kg/ha	> 25.0 kg/ha
	Av. P2Os	<20.0 kg/ha	20-50 kg/ha	> 50 kg/ha
iii)	Available Potassium (K)	below 110 kg/ha	110-280 kg/ha	> 280 kg/ha
	Av. K2O	< 144	144-336	> 336

immobilization will not proceed because the residue contains sufficient N to meet the microbial demand during decomposition.

## C/N Ratio effects on N Mineralization & Immobilization

The ratio of % C to % N (C/N ratio) defines the relative quantities of these two elements in crop residues and other fresh organic materials, soil OM and soil MO.

The N content of humus or stable soil OM ranges from 5.0 - to 5.5%, while C ranges from 50 to 58%, giving a C/N ratio ranging between 9 and 12.

Whether N is mineralized or immobilized depends on the C/N ratio of the OM being decomposed by SMO.

For example, a typical soil mineralized 0.294 mg N, as measured by plant uptake. When residues of variable C/N ratio are added to the soil, N mineralisation or immobilization would be indicated if plant uptake was greater or less than 0.294 mg N, respectively. In this study, a C/N ratio of approximately 20:1 was the dividing line between immobilization and mineralization.

Generally, when organic substances with C/N ratios greater than 30:1 are added to soil, there is immobilization of soil N during the initial decomposition process.

For ratio between 20 and 30, there may be neither immobilization nor release of mineral N. If the organic materials have C/N ratio of less than 20, there is usually a release of mineral N early in the decomposition process.

## C/N ratio in a selection organic material

Organic substances		C/N ratio
1.	SMO (Soil Microorganisms)	8:1
2.	SOM (soil organic matter)	10:1
3.	Corn/Sorghum stover	60:1
4.	Corn/sorghum grain straw	80:1
5.	Sawdust (generally)	400:1

In situations where Ca is required without the need for correcting soil acidity – gypsum is used.

Gypsum Cu SO<sub>4</sub> 2  $H_2O$  deposits are found in many locations. Large amounts of by-product gypsum are produced in the manufacture of phosphoric acid.

Gypsum is a common source of Ca

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Magnesium Mg++
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Arid and semi arid regions soils high Mg (due to Mg parent material)

Primary Minerals (1) Biotite, dolomite, hornblande, olinene, serpentine

Secondary minerals – Clay minerals – Chlorite, illite montmorollionite, and vermiculite

Fertilizer Magnesium Sulphate 9.8% Mg

Potassium magnesium sulphate 11% Mg

Micronutrients

Fe (Iron) Source

Primary minerals Olivine, Pyrite, Siderite, Hematite, Goethite, Magnetite, Limonite

Fe Cycle

