Course No: SSAC-353

Credit: 2 + 1 = 3

College of Agriculture, Loni

Lecture 1 & 2

History of Soil Fertility and Plant Nutrition

Presented by:

Dr. Rahul I. Navsare

Soil Fertility:-

Soil fertility is the ability of the soil to supply essential plant nutrients during growth period of the plants, without toxic concentration of any nutrients ***i.e. "the capacity of soil to supply nutrient in available form to crop".***

• It is defined as the **inherent capacity** of a soil to supply available nutrients to plants in an **adequate** amount and in suitable proportions to maintain growth and development.

Soil productivity:-

- Soil productivity means the crop producing capacity of soil which is measured in **terms of yield**. Productivity is very broad term and fertility is only one of the factors that determine the crop yields. Soil, climate, pests, diseases, genetic potential of crop and man's management are the main factors governing land productivity, as measured by the yield of crop. To be productive, soil must contain all the **17** essential nutrients required by the plants.

• The quantity of nutrients is not only being sufficient but they should also be present in an easily **"available"** form and in **"balanced"** proportions .

" All the productive soils are fertile but not all fertile soils are productive"

Sr. No.	Soil Fertility	Soil Productivity
1	It is the ability of soil to supply all essential plant nutrients in available forms to the crop plants.	It is the capacity of soil to produce crop per unit area of the field.
2	It is considered as an index of available nutrients.	It is used to indicate yield of crops.
3	It is one of the factor for crop production and other factors are moisture, topography, tillage practices, varieties, organic matter content of soil etc.	It is the interaction of all the factor that determine the magnitude of yield.
4	It can be analyzed in lab.	It can be assessed in field in a particular climate and system of management.
5	It is the potential status of soil to produce crops.	It is resultant of various factors influencing soil management.
6	A fertile soil may or may not be productive.	All productive soils are always fertile.

Factors affecting soil fertility:-

I. Natural factors or Pedogenic factors

a. Parent material
b. Climate and vegetation
c. Topography

II. Soil management factors

1. Physical condition of soil

a. Soil texture
b. Soil structure
c. Soil water
d. Soil aeration

2. Root growth

3. Organic matter content in soil

4. Soil erosion

Some Terminology Related to Plant Nutrients:

Plant Nutrition:

Plant nutrition is defined as the supply and absorption of chemical compounds required for plant growth and metabolism. It is the process of absorption and utilization of essential elements for plant growth and reproduction.

Nutrients:

Nutrients may be defined as the chemical compounds required by an organism.

Deficient:

When an essential elements is at a low concentration that severely limits yield and produces more or less distinct deficiency symptoms.

Extreme deficiencies will lead to death of the plant.

Insufficient:

Nutrient contents associated with only growth reductions and not accompanied by appearance of deficiency symptoms are termed insufficient.

Sufficient:

Range of nutrient content in plant associated with optimum crop yields is called sufficient.

Toxic:

When the concentration of nutrient elements rises too high to cause significant growth reductions, it is termed toxic.

Severe toxicity will result in death of plants.

Excessive:

When the concentration of an essential plant nutrient is sufficiently high to result in a corresponding shortage of another nutrient.

Beneficial elements:

Beneficial elements are the mineral elements which stimulate plant growth, but are not essential or which are essential only for certain plant species or under specific condition.

Functional nutrients:

This term introduced by **Nicholas (1961)** is defined as an element that play a role in plant metabolism.

Trace elements:

Trace elements is an element found in low concentration, perhaps less than one ppm or still less in soil, plant and water etc.

History of Development of Soil Fertility:-

The concept of soil fertility and its management to improve crop yields is not new perhaps it is as old as the development of agriculture by man. In ancient time also, they had knowledge of applying manures such as farm yard manure, green manure, night soil, wood ashes etc., to soil for the purpose of increasing crop yields.

Xenophan (430-355 B.C.) a Greek historian first recorded the merits of green manure crops. He wrote “But then whatever weeds are upon the ground, being turned into the earth, enrich the soil as much as dung “meaning incorporating weeds in to soils is as good as applying dung.

Cato (234-149 B.C.) wrote a practical hand book and recommended intensive cultivation, crop rotations and the use of legumes for livestock farming. He was first to classify “Land” based on specific crops.

Jethro Tull (1731) claimed that nitrate salts, water, air, earth, Epsom salts (MgSO4), Saltpetre (sodium & potassium nitrate), potassium sulphate and Olive oil increased plant growth.

Francis Bacon (1591-1624) suggested that the principle nourishment of plants was water and the main purpose of the soil was to keep plant erect and to protect from heat and cold.

Justus Von Liebig (1840),

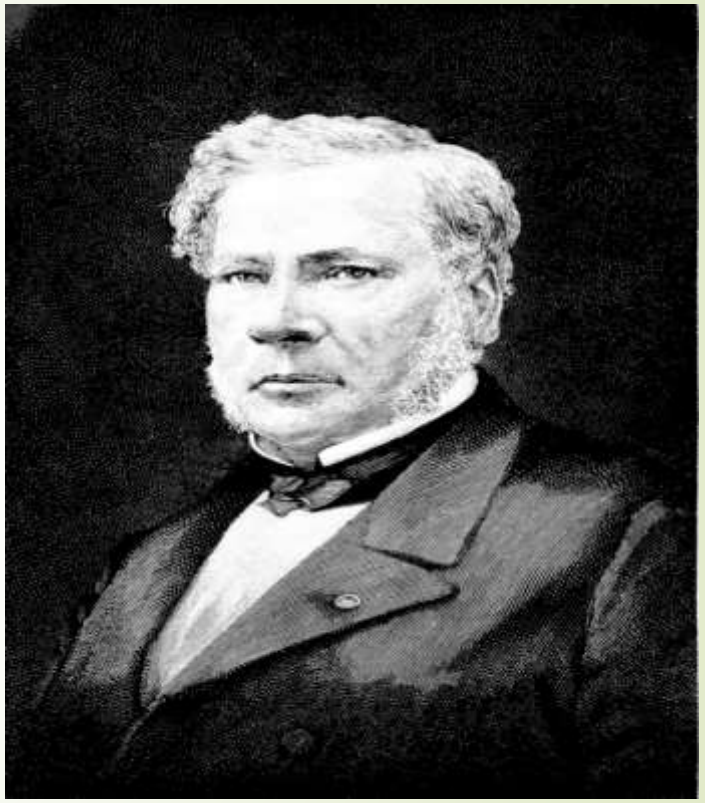
a German Chemist, reported that growing plants obtain elements Ca, K, S and P from the soil, where as carbon from CO2 in the air and not from the soil. He also suggested that plants obtain H & O from air as well as from water and N from ammonia.

- He established the theory of **"Law of Minimum"** in relation to plant nutrition. The law state that the productivity of a crop is decided by most limiting factor.
- He is regarded as the **"Father of Agricultural Chemistry"**

J. B. Boussingault (1802-1882)

a French chemist conducted field experiment and maintained balance sheet. He was **first** scientist to conduct field experiment.

He is considered as a ***Father of field experiment.***




THANK
YOU