Indicator plants:

Certain plants are very sensitive to deficiency of a specific plant nutrient and they produce specific symptoms which are different from other deficiency symptoms. Thus the deficiency of that element can easily be detected. The indicator plants are the following

Element	Deficiency indicator plant
N	Cauliflower, Cabbage
P	Rape seed
K	Potato
Ca	Cauliflower, Cabbage
Mg	Potato
Fe	Cauliflower, Cabbage, Potato
Na	Sugar beet
Mn	Sugarbeet, Oats, Potato
B	Sunflower

Soil test based fertilizers recommendation:-

This was put forth by Ramamoorthy (1971). The underlying principle is to get as a large variation as possible in the soil fertility levels in one and the same field in a given locality where an elaborate field experiment is conducted so that the real relationship between the yield and the level of soil fertility could be evaluated without interference from other factors affecting the yield.

A large field of certain amount of natural variation in fertility is chosen. It is divided into four strips which are treated with four different doses of N, P and K viz., control ($N_0P_0K_0$), half of the normal dose ($N_{1/2}P_{1/2}K_{1/2}$), normal dose ($N_1P_1K_1$) and double normal dose ($N_2P_2K_2$) of N, P and K fertilizers that are usually applied to the high yielding varieties of the crops in the country. Exhaustive crop like sorghum, maize, wheat or rice are grown on this field to deplete

the soil fertility level in the strips treated with fertilizers. An experiment is then laid out on this field for the purpose of Soil Test Crop Response (STCR) correlation with 21 treatments having different N, P and K randomly arranged in each strip in such a way that there is an untreated check plot on either side of the treated plot.

The soil test crop response correlation work is then carried out taking the yield of treatments and the average of the two controls (check) plots into consideration.

Critical soil test level approach

The critical soil test level, concept advanced by Cate and Nelson (1965) is the level of the nutrient below which a reasonably satisfactory economic response should be expected from the application of that particular nutrient and above which the probability of such response is low. In order to apply this concept, the soil is collected from each field are analysed, field experiments are conducted with application of graded doses of nutrient and response curve is fitted. A scattered diagram of percentage yield on Y-axis and soil test value on X-axis is then plotted. It is divided into four quadrants positioning the lines in such a way that the number of points in the upper right and lower left quadrants is maximum. The point where the vertical line crosses the X-axis is defined as the critical soil test value.

Critical levels of nutrients in soils:

Critical value may be defined as the nutrient concentration below which the plants are expected to respond to the application of that nutrient.

Critical level of micro nutrients in soils

Micronutrient	Indices	Critical level (ppm)	
		Range	Mean
B	Hot water soluble	0.1 – 2.0	0.7
Cu	Mehlich No.1	0.1 – 10.0	3.0
	DTPA + Ca Cl_2 (pH 7.3)	0.12 – 2.5	0.8

	AB-DTPA (pH 7.6)	**----**	**1.8**
Fe	**DTPA + Ca Cl_2 (pH 7.3)**	**2.4 – 5.0**	**4.0**
	AB-DTPA (pH 7.6)	**----**	**4.0**
Mn	**Mehlich No.1**	**4.0 – 8.0**	**7.0**
	DTPA + Ca Cl_2 (pH 7.3)	**1.0 – 2.0**	**1.4**
	0.03 M H_3PO_4	**0-20.0**	**10.0**
	AB-DTPA (pH 7.6)	**----**	**1.8**
Mo	**$(NH4)_2C_2O_4$ (pH 3.3)**	**0.04 – 0.2**	**---**
Zn	**0.1 N HCl**	**2.0 – 10.0**	**5.0**
	Mehlich No.1	**0.5 – 3.0**	**1.1**
	DTPA + Ca Cl_2 (pH 7.3)	**0.25 – 2.0**	**0.8**
	AB-DTPA (pH 7.6)	**----**	**1.5**

Use of empirical equations for scheduling fertiliser P dosage to crops

Krishnamoorthy et al., (1963) worked out empirical relationships between the nature of the soil and the extractable P. They found that the capacity to fix added phosphates is largely a function of the type and amount of clay present in the soil.

In the case of typical black cotton soil consisting of montmorillonite and beidellite type of clay minerals, the extractability of added phosphates is given by the formula

Percentage extractable P = 100 – Clay percentage

ii) In the case of red and alluvial soils where illite dominates, the relationship appears to be

Percentage extractable P = 100 – 2 (Clay percentage)