

LECTURE 19

PERMANENT MANURIAL EXPERIMENTS

OPM, NPM, LTFE, Findings

Permanent Manurial Experiments

Permanent manurial experiments are conducted to study the long term effect of continuous application of plant nutrients either singly or in combination and with or without organic manure on crop yield, nutrient uptake, and physico-chemical and biological properties of soil.

The first one started was the classical field experiment at **Rothamsted** Experimental Station, Harpenden in **England** in 1854 by Lawes and Gilbert.

Most of PME's test common treatment combinations like: Fertilizer N or P or K alone, Fertilizer N and K, Fertilizer N and P, Fertilizer NPK, Farmyard Manure (FYM), Residual effect of FYM, Hand weeding, Zn or S addition, Control (no manure), tillage, irrigation, etc.

Similar to Rothamsted experiment, in India PME was started at **Coimbatore** in **1909** and this was the first of its kind in our country. This called as Old Permanent Manurial experiment (**OPM**) is being conducted in red soil (Alfisol) with cereal-cotton crop rotation under **rainfed** conditions.

Subsequently in **1925**, a second experiment was started with the same treatments and called as New Permanent Manurial (**NPM**) experiment to test the effect under **irrigated** conditions.

In **OPM** and **NPM** a uniform fertilizer dose of 25-60-75 kg N, P₂O₅ and K₂O/ha is being applied in all these years. As these are designed with very low dose of fertilizers and manures without any replication and randomization, they do not match to the present day use pattern of fertilizer/manure and statistical analysis.

Therefore, to study the effect of **intensive cropping and manuring** new set of experimental design was implemented all over India by ICAR by a coordinated scheme on Long Term Fertilizer Experiment (**LTFE**). During 1972, LTFEs were started at 11 centres and later further expanded at seven more centres.

Under this scheme, a third experiment was started in 1972 at Coimbatore called as Long Term Fertilizer Experiment (LTFE) in medium black soil (Inceptisol) to test intensive cropping system with Ragi-maize cropping system.

The **major findings** in these experiments are:

- Application of single nutrient (N or P or K) alone resulted in lower crop yield. Combination of NP and NPK gave higher yield.
- Phosphorus became a limiting factor when it was not applied and it reduced the yield to the extent of 50-60 per cent. Application of P along with N, K, and FYM raised the available soil P from low to medium status.
- Potassium was depleted even when it is applied continuously.

- Continuous use of N fertilizer alone reduced the soil productivity. Addition of FYM with NPK significantly increased the crop yield to the tune of 15-20 per cent over NPK alone. Addition of organic manure improved pore space and water holding capacity of soil. Combined application of organic manure and inorganic fertilizer not only increased the yield of crops but also improved the soil productivity.
- Population of bacteria, fungi, *Actinomycetes* and *Azotobacter* were increased due to organic manure incorporation. The activities of enzyme urease, dehydrogenase, cellulase, and amylase were favored by organic manure application.