

INTEGRATED NUTRIENT MANAGEMENT IN DRYLAND AGRICULTURE

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INTRODUCTION

Sustainable food production can be achieved with proper attention in irrigated system, but it is a challenging task in dryland situation due to aberrant weather conditions. Rainfed agriculture contributes 40% of food grain production. Due to low availability of FYM, continuous application of only chemical fertilizers coupled with moisture stress has a deleterious effect on soil physicochemical properties. This has created an imbalance in nutrient requirement for crop growth, build-up of certain nutrients especially phosphorus which antagonize the uptake of other nutrients and limited use of potash fertilizers, resulted in decline in crop productivity

Reasons for low Fertility of dryland soils

- Fertilizer use in dryland soils is less than irrigated lands.

- Crop residue input into the soil is also low due to strong crop-livestock interaction in dryland areas.
- Maintaining or improving SOC concentration in rainfed dryland agroecosystems is a major challenge.
- Movement of water in the dryland soils leading to salinization and nutrient deficiencies especially micronutrients.
- Removing crop residues is leaving the soil surface exposed to erosion by water and wind and leading to land degradation.
- Removal of residues is leading to rapid depletion of soil organic matter and inorganic nutrient reserves.

Strategies to improve Fertility of dryland soils

Soils under rainfed cultivation are having poor soil fertility and low organic matter status, therefore, soil health care is a major factor in sustaining crop productivity in those soils. Majority of the farmers in rainfed regions are small and resource poor. Rainfed regions face twin problems of water thrust and plant nutrient hunger leading to poor yield. Hence appropriate water and nutrient management practices need to be followed for sustained crop production.

In the nutrient management strategies, inclusion of organic manures will be of great use to improve water and soil fertility management. Generally, 12.5 t of organic manure ha⁻¹ is recommended to sustain the soil health which will not be always feasible for the rainfed farmers. However, enriching the recommended chemical fertilizers with small dose of FYM to various crops will lead to increased nutrient availability and fertilizer use efficiency.

Preparation of enriched FYM

a. Macronutrients

- ✓ Mix the recommended dose of super phosphate per ha with well rotten FYM (750 kg)
- ✓ Sprinkle water to keep the mixture moist.
- ✓ Fill the mixture in a polythene gunny bag and tie it with rope to make it air tight
- ✓ Open the bag after one month of anaerobic incubation and mix with recommended dose of N and K fertilizers.
- ✓ Apply to soil during the last plough or before sowing

The benefits for the FYM enrichment are as follows:

- ✓ Enhanced Phosphorus availability to crops
- ✓ Reduced fertilizer cost
- ✓ Increased yield to the tune of 200 kg ha⁻¹

b. Micronutrients

Micronutrient deficiencies are quite common in majority of the cultivable lands. To remediate the deficiencies mostly chemical fertilizers are being opted however the use efficiency of micronutrients is very low (1 – 5 %). Moreover, if the level of particular macronutrients viz, P in soil is high, the availability of applied micronutrients will be impaired. To avoid this problem, incubate the micronutrients with small dose of organic manures and then apply as enriched organic manures to crops. For Zn enrichment the following steps are to be followed.

- ✓ Mix the recommended dose of ZnSO₄ (25 kg ha⁻¹) with well rotten FYM at 1:10 ratio

- ✓ Sprinkle water to keep the mixture moist.
- ✓ Fill the mixture in a polythene gunny bag and tie it with rope to make it air tight
- ✓ Open the bag after one month of anaerobic incubation and apply to soil at the time of sowing

By using the enriched FYM, micronutrient fertilizer use efficiency and crop uptake can be improved. The crop yield will also be increased by 10 – 20 per cent.

c. STCR – IPNS approach

Soil testing and plant analysis are essential tools for managing crop nutrients in environmentally sound, sustainable farming system. Hence an integrated approach has to be followed. First, use all farm available sources of nutrients like FYM, Compost, green manure etc. Later, the remaining nutrient amounts of recommended dose of particular target yield of specified crop should be supplied by inorganic fertilizers.

d. Method of application of fertilizers

Improved method of application of fertilizers with proper time will enhance the efficiency of nutrients. Specifically, banding of nutrients close to the seed at planting will improve nutrient-use efficiency.