



IIT KHARAGPUR



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CERTIFICATION COURSES

Organic Farming for Sustainable Agricultural Production

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Lecture 22 : Introduction to Organic Crop Management (contd.)

Nutrient Management

- Factors considered for nutrients management:
 - ✓ Amount of plant available nutrients already present in soil
 - ✓ Nutrient use efficiency of crop
 - ✓ Yield of crop
 - ✓ Physio-biochemical needs of the crop
 - ✓ Organic carbon status of soil
- The 4R's in precision nutrient management:
 - Right quantity
 - Right source
 - Right time
 - Right method

Recommended Nutrient Quantity

Blanket/General recommendation:

General Recommendations are based on large number of experiments conducted at different locations. General fertilizer recommendation is equated with medium fertility status of soil. For low and high rating, the dose is correspondingly decreased or increased by 25% of the recommended dose.

Major problems:

- Soil is categorized to medium, low and high, irrespective of crop.
- Crops have variable requirement of nutrient and respond differently to applied fertilizer in different soils

Rating limits of soil test value used in India

Nutrient	Low	Medium	High
Organic carbon, %	<0.5	0.5-0.75	>0.75
Available N, kg/ha	<280	280-560	>560
Available P, kg/ha	<10	10-25	>25
Available K, kg/ha	<108	108-280	>280

Nitrogen dose in rice:

Medium fertile soil: 100 kg N/ha
Low fertile soil : 125 kg N/ha
High fertile soil : 75 kg N/ha

Recommended Nutrient Quantity

Balance sheet method:

$$Y.b = (N_{\text{rec}} + N_{\text{min}})E_1 + N_o.E_2 + N_a.E_3$$

Y = Crop yield target, kg/ha

b = Nutrient uptake by the entire crop for unit yield (economic + byproduct), kg/kg

N_{rec} = Nutrient recommendation, kg/ha

N_{min} = Amount of mineral N present in the soil, kg/ha

N_o = Amount of N mineralized from organic matter present in the soil, kg/ha

N_a = Amount of N supplied to soil through dry and wet atmospheric deposition, kg/ha

E = Efficiency factors

Recommended Nutrient Quantity

Balance sheet method:

$$Y.b = (N_{\text{rec}} + N_{\text{min}})E_1 + N_o.E_2 + N_a.E_3$$

Compute the N recommendation, kg/ha for rice crop with the following information:

Y = 5.0 t/ha for grain yield and 4.0 t/ha for straw yield on dry weight basis

b, Grain N content = 1.5 %, Straw N content = 0.8%

$N_{\text{min}} = 150 \text{ kg/ha}$

$N_o = 20 \text{ kg/ha}$

$N_a = 05 \text{ kg/ha}$

$E_1 = 0.40$, $E_2 = 0.50$, and $E_3 = 0.40$

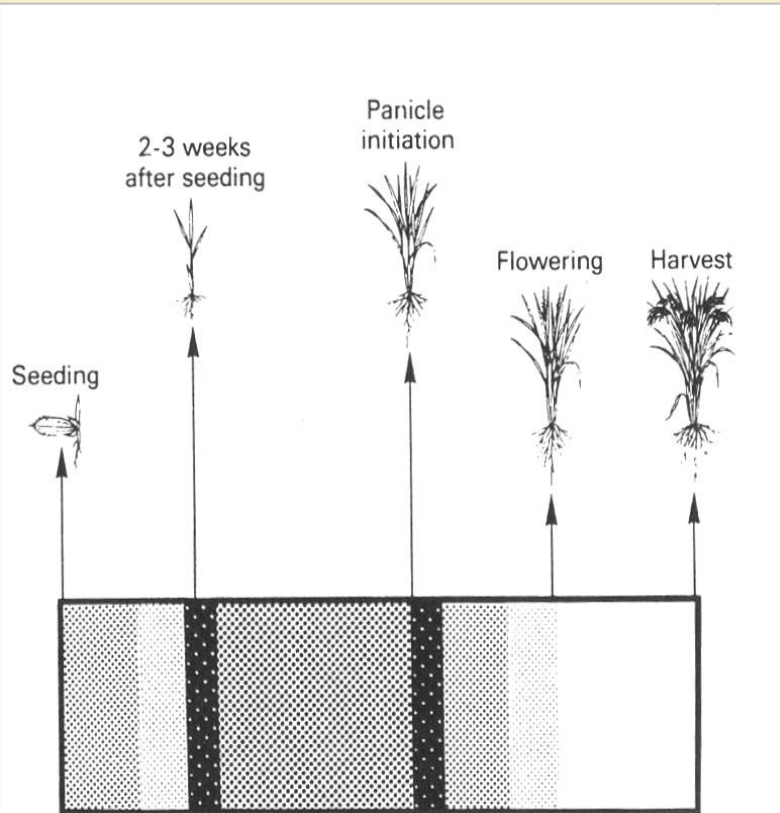
Nutrient composition of some of organic resources

Material	Content, %		
	N	P ₂ O ₅	K ₂ O
Cattle dung	0.35	0.12	0.17
FYM	0.75	0.2	0.5
Rural compost	0.75	0.2	0.5
Urban compost	1.75	1.0	1.5
Water hyacinth compost	2.0	1.0	2.3
Rice straw	0.61	0.18	1.38
Wheat straw	0.48	0.16	1.18
Sugarcane trash	0.40	0.18	1.28
Neem cake	5.22	1.08	1.48

N recommendation = 100 kg/ha

Nutrient Source	Quantity, kg/ha
FYM	13333
Water hyacinth compost	5000
Urea	218

Right Timing of nutrient application



Darker the shade is the better time of fertilizer application in Rice

Nutrient Management

- Farm yard manure is applied @ 5 t/ha
- Fertilizer dose: 100:50:50 kg/ha of N:P₂O₅:K₂O
 - Full P and K as basal at the final land preparation
 - N in three splits at
 - Basal (Planting/sowing)
 - Tillering, 15 days after planting
 - Panicle initiation stage

Right method of application

- **Broadcasting**
- **Placement**
- **Pellet application**
- **Through irrigation (Fertigation)**

Broadcasting

- **Basal application**
- **Top dressing**

Placement

- **Plough sole placement**
- **Deep placement**
- **Band placement**
 - **Hill placement (orchard crops)**
 - **Row placement (row crops)**

Nutrient use efficiency

Agronomic N Use Efficiency (AE_N)

Nutrient Recovery Efficiency (RE_N)

$$AE_N \text{ (kg kg}^{-1}\text{)} = \frac{\text{Grain yield in N fertilized plot} - \text{Grain yield in control plot}}{\text{Quantity of N fertilizer applied in fertilized plot}}$$

$$RE_N \text{ (kg kg}^{-1}\text{)} = \frac{\text{Total N uptake in fertilized plot} - \text{Total N uptake in control plot}}{\text{Quantity of N fertilizer applied in fertilized plot}}$$