





## Site-specific nutrient management

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### What is site-specific nutrient management (SSNM)




- Supplying plants with nutrients to optimally match their spatial and temporal need for supplemental nutrients






## Lowland rice production in Asia


- **Small landholdings and fields**
- **Large variation among fields and among seasons**
- **Needs for nutrient inputs can vary greatly across short distances**



## Principles and objectives of SSNM are similar for

- **Small fields with little or no mechanization in Asia**
  - **Concern: Variability between fields, seasons, and years**
  - **Need: Simple technologies**
- **Large fields with mechanization**
  - **Concern: Within field variability**
  - **Need: sophisticated technologies ('precision agriculture')**





## Why is SSNM important for FBMPs?

- It can increase profit
  - Higher yields
  - Higher nutrient use efficiency (output/input)
  - Reduced disease and pests
- It can benefit environment



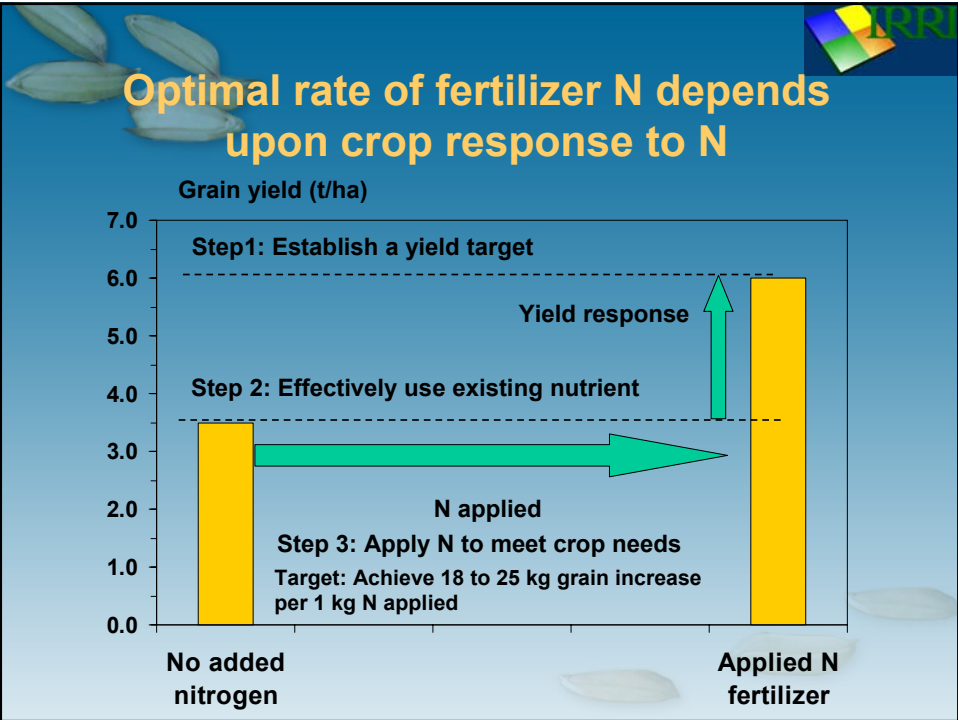
## SSNM provides an approach for

- Before the season determination of fertilizer needs
  - Prescriptive
  - Can be plant or soil based
- Within-season adjustment in fertilizer N rates
  - Responsive to current conditions
  - Corrective
  - Plant-based --- 'Matching supply to crop needs'



## Principles for N management

- **Determine total fertilizer N requirement from**
  - Anticipated crop response to applied N
  - A target N use efficiency
- **Select first fertilizer N application based on**
  - Anticipated crop response to applied N
  - Traits of crop variety
- **Vary within-season fertilizer N based on**
  - Plant N status
  - Anticipated crop response to applied N




## Estimated total fertilizer N requirement

40 to 55 kg fertilizer N for each 1 ton increase in grain yield from use of fertilizer N

N use efficiency (kg grain increase/kg N applied) →	15	18	20	25
Crop response to N (t/ha) ↓	Fertilizer N rate (kg/ha)			
1	65	55	50	40
2	130	110	100	80
3	195	165	150	120
4		220	200	160
5			250	200

## Select rate for first fertilizer N application based on crop response to N


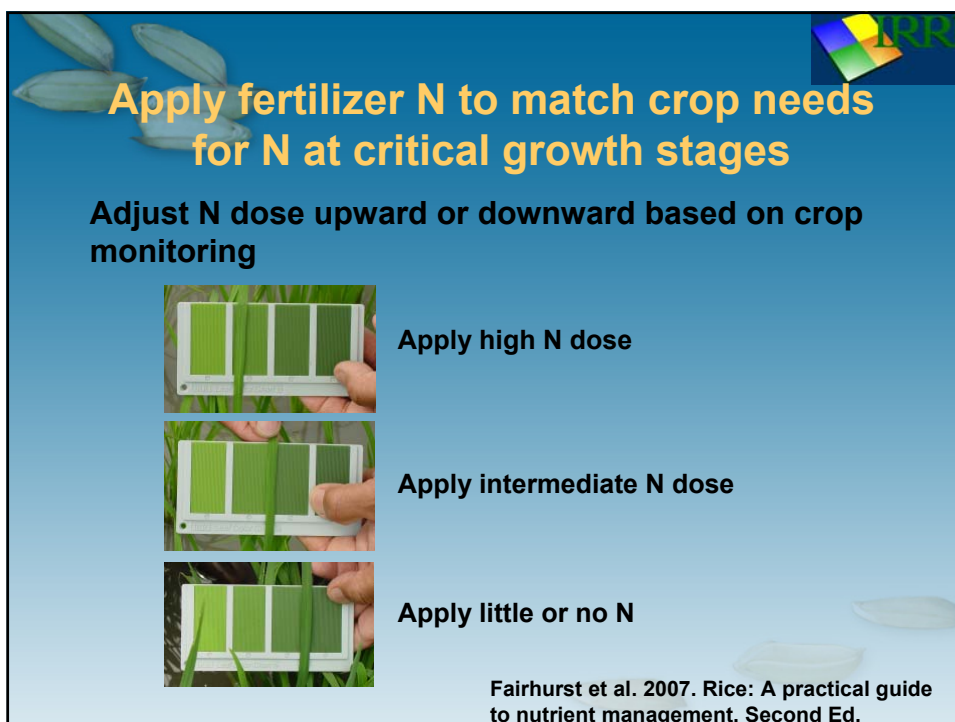
Crop response to N (t/ha)	Fertilizer N rate (kg/ha)	
	Inbred and hybrid rice	Very large panicle type rice
1	0	25
2	20	30
3	30	40
4	45	50



## Vary within-season fertilizer N

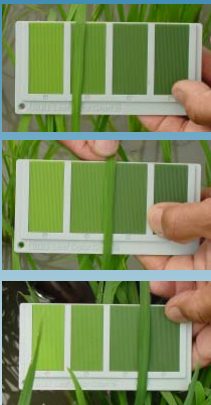
**Diverse technology options for a similar objective**

- Plant tissue or sap analysis
- Plant sensors
  - On-the-go sensors (precision agriculture)
  - Hand held meters
  - Low tech leaf color measurement



## Apply fertilizer N to match crop needs for N at critical growth stages

**Adjust N dose upward or downward based on crop monitoring**






- Apply high N dose
- Apply intermediate N dose
- Apply little or no N

Fairhurst et al. 2007. Rice: A practical guide to nutrient management. Second Ed.

## Vary within-season fertilizer N based on plant N status and crop response to N

(Amount of N to apply at active tillering and panicle initiation to rice in Indonesia)

LCC reading (immediately before N application)		Application of urea (kg/ha)			
		Crop response 1 t/ha	Crop response 2 t/ha	Crop response 3 t/ha	Crop response 4 t/ha
	LCC ≤3	75	100	125	150
	LCC = 3.5	50	75	100	125
	LCC ≥4	0	0-50	50	50

## Common principles for site-specific N management across degrees of technological sophistication

- **Determine total fertilizer N requirement from**
  - Anticipated crop response to applied N
  - A target N use efficiency
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