

# Use of mobile phone technology to improve nutrient management for rice

**Roland J. Buresh**

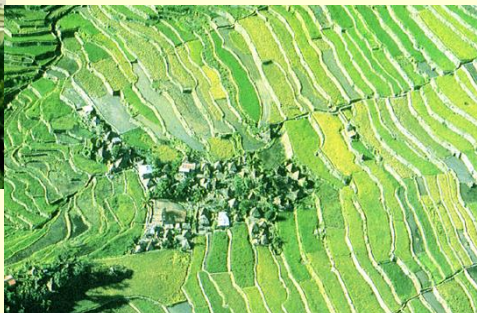
**International Rice Research Institute  
(IRRI), Philippines**



## Rice in Asia is typically produced in small landholdings



**Farming practices  
vary among farmers  
and fields**



## Crop needs for nutrient inputs can vary greatly among fields



### Factors affecting crop needs for nutrients vary among fields:

- Yield of the crop
- Amount of crop residue retained in the field
- Crop rotation
- Past fertilizer use

## Farmers often do not apply nutrients most effectively



### Often apply fertilizers

- at wrong times
- in wrong amounts
- as wrong sources



## Rice farmers in Asia need appropriate precision agriculture for management of nutrients in small landholding

### Technology must be

- Cost effective
- Rapid
- Easy to use
- Accessible in remote areas

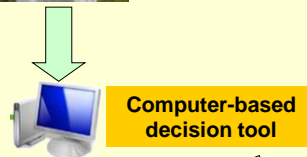


## Tailor the approach of precision agriculture to small landholdings

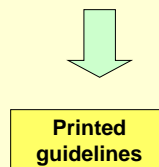
1. Acquire information for a specific location --- often less than 1 hectare



2. Compute location-specific nutrient needs



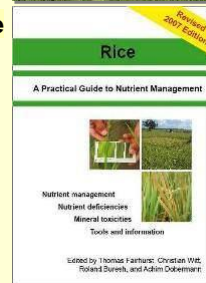
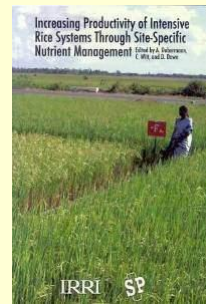
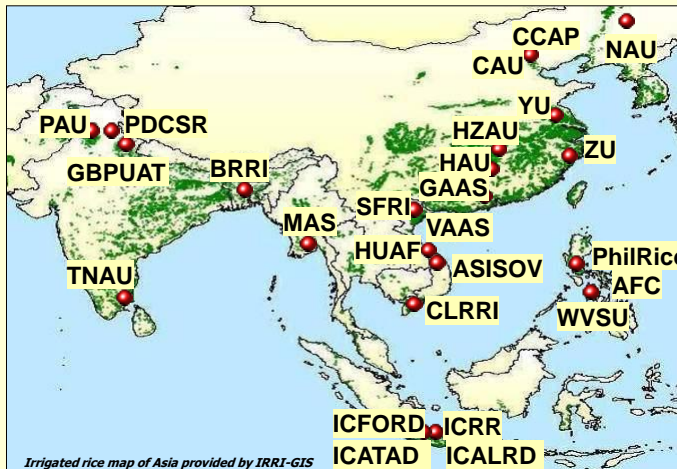
3. Provide location-specific guidelines in an easy-to-use form --- often no internet and only infrequent contact with extension



## Starting point is the 'computer-based decision tool'

- Develop using best available science
- Adapt to country or regional conditions
  - Tailor to local rice cultivation practices
  - Use locally available fertilizer sources
- Target for use by crop advisors, extension, and progressive farmers

## More than 10 years of research provide principles of site-specific nutrient management (SSNM)



# Principles of SSNM were initially used to develop printed guidelines

- Aimed to reach many farmers fast
- Printed materials failed to adequately handle the complexities of decision making for specific fields

**Implementing site-specific nutrient management (SSNM) for direct wet-seeded rice in Iloilo Province, Philippines**

The guidelines given below apply to irrigated direct wet-seeded rice in Iloilo. For soil with a cation exchange capacity (CEC) of 10 or less, increase the N and P fertilizer rates by 20%.

Apply fertilizer nitrogen (N), phosphorus (P<sub>2</sub>O<sub>5</sub>), potassium (K<sub>2</sub>O), and zinc (Zn) at critical growth stages and days after sowing (DAS) as indicated below.

**Stage 1. Apply fertilizer during early growth within 14 DAS.**

1. For the following steps, use the soil test results to determine fertilizer needs for a specific field.

2. Apply N and P fertilizer based on the values of C and P in the soil.

3. Apply K fertilizer if the soil test result is below the target value.

4. Apply Zn fertilizer if the soil test result is below the target value.

5. Apply fertilizer N, P, K, and Zn based on the soil test results.

6. Apply fertilizer N, P, K, and Zn based on the soil test results.

**Stage 2 and 3. Apply fertilizer N as needed for the crop, based on soil test results.**

7. Apply N fertilizer at active tillering and panicle initiation, and apply Zn at heading.

8. Apply N fertilizer at heading and panicle initiation, and apply Zn at heading.

**Stage 4. Apply fertilizer N, P, K, and Zn at panicle initiation, heading, and harvest.**

9. Apply N fertilizer at panicle initiation, heading, and harvest.

10. Apply P fertilizer at panicle initiation, heading, and harvest.

11. Apply K fertilizer at panicle initiation, heading, and harvest.

12. Apply Zn fertilizer at panicle initiation, heading, and harvest.

**Soil test interpretation table:**

Soil Test	Value	Interpretation
CEC	10 or less	High
CEC	11-20	Medium
CEC	21-30	Low
CEC	31-40	Very Low
CEC	41-50	Very Very Low
CEC	51-60	Extremely Low
CEC	61-70	Extremely Very Low
CEC	71-80	Extremely Very Very Low
CEC	81-90	Extremely Very Very Very Low
CEC	91-100	Extremely Very Very Very Very Low

**Implementing site-specific nutrient management (SSNM) for transplanted rice in Indonesia**

The guidelines given below apply to irrigated transplanted rice in Indonesia. For soil with a cation exchange capacity (CEC) of 10 or less, increase the N and P fertilizer rates by 20%.

Apply fertilizer nitrogen (N), phosphorus (P<sub>2</sub>O<sub>5</sub>), potassium (K<sub>2</sub>O), and zinc (Zn) at critical growth stages and days after sowing (DAS) as indicated below.

**Stage 1. Apply fertilizer during early growth within 14 DAS.**

1. For the following steps, use the soil test results to determine fertilizer needs for a specific field.

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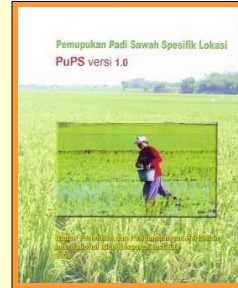
# Nutrient Manager for Rice was developed to provide the needed 'computer-based decision tool'

- It presents a farmer or extension worker with 10 to 15 easy-to-answer questions about a field
- The farmer or extension worker responds to the questions in less than 15 minutes
- The farmer or extension worker then receives a nutrient management guideline tailored to their specific field and crop-growing conditions



# IRRI Nutrient Manager for Rice was first developed in 2008

- Initially released on CD in the Philippines and Indonesia
- Each version was adapted to the specific country
- Targeted for extension workers, crop advisors, and farmers



# IRRI Use the Nutrient Manager decision tool within precision agriculture for small landholders



1. Acquire information for a specific location



2. Compute location-specific nutrient needs

3. Provide location-specific guidelines in an easy-to-use form



## IRRI Mobile phone application of *Nutrient Manager* using interactive voice response (IVR)



Mobile phone  
SMS compatible

1. Call toll-free number

IVR implementation  
box

2. Capture information  
with voice recording  
and phone key pad

5. Transmit SMS  
message to  
farmer

3. Transmit information  
to NM Rice program



4. Process  
information and  
develop SMS  
message



Totally automated: No phone operator, no technical expert required to be on standby

## IRRI Example of text message from the mobile phone application (NMRiceMobile) in the Philippines



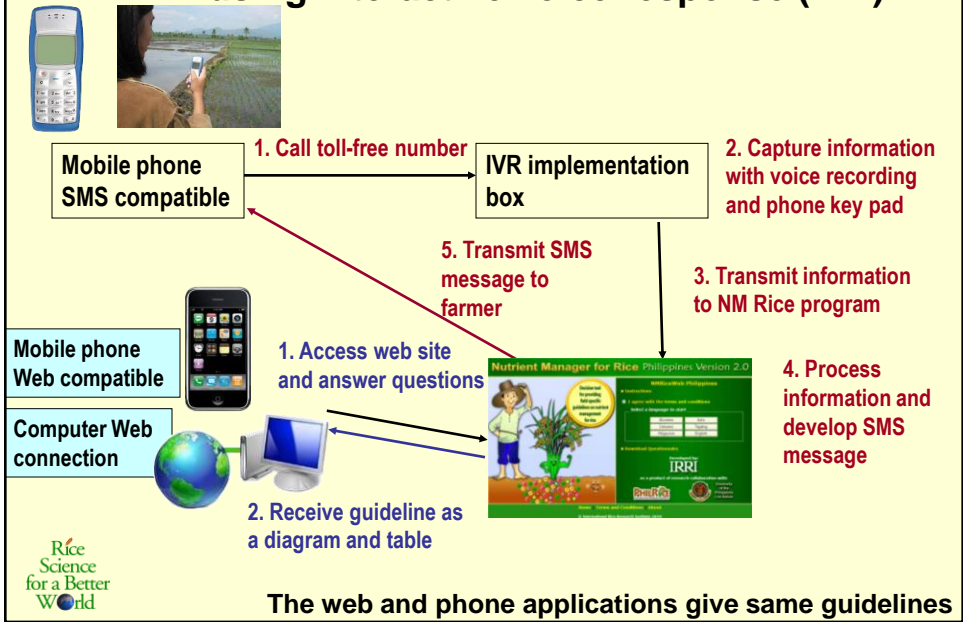
NMRice: For 94-105 sacks of palay on 1 hectare in dry season w/ good management practices: Apply 3 bags 14-14-14 basal or w/in 10 days after transplanting (DAT), 1 bag urea at 21 to 25 DAT, 1 bag urea at 30 to 34 DAT. For queries, call DA at 1-800-10-982-2474

### Key ingredients

- Apply N at critical growth stages
- Adjust fertilizer rates for yield level
- Adjust fertilizer K for inputs from crop residues and organic materials



# IRRI Mobile phone application of *Nutrient Manager* using interactive voice response (IVR)



# IRRI Example of nutrient management guideline from web application in the Philippines

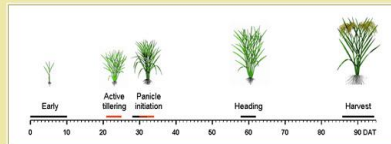
## Nutrient Manager for Rice Philippines Version 2.0

Name: Juan dela Cruz  
 Mobile phone number: 09998887777  
 Location: San Jose, Nueva Ecija, Region III  
 Field size: 1 ha  
 Variety: PSB Rc62 (Pefaranda)

Rice crops per year: two  
 Season: dry season  
 Transplanted: 101-110 days from seed to harvest  
 Seeding: less than 23 days

### Key ingredients

- Apply N at critical growth stages
- Adjust fertilizer rates for yield level
- Adjust fertilizer K for inputs from crop residues and organic materials



**Nutrients from other inputs:**  
 1. Crop residue: low  
 2. Organic materials: none  
 3. Other organic materials: none  
 4. Sediment and flooding input: none

Values are adjusted to actual field area: 1 ha

Growth stage	DAT**	Current yield: 90 sacks at 50 kg/sack 4.1 t/ha (14% MC)	DAT**	Higher yield***: 94-105 sacks at 50 kg/sack 4.3-4.8 t/ha (14% MC)
Early*	0-10	14-14-14: 2 1/2 bags	0-10	14-14-14: 3 bags
Active tillering	-	-	21-25	urea: 1 bag
Panicle initiation	28-32	urea: 1 1/2 bags	30-34	urea: 1 bag

Consult PalayCheck for good crop management practices.  
 >> <http://www.pinoyrkb.com>


\* Application of fertilizer during early stage can be basal  
 \*\* DAT - days after transplanting  
 \*\*\* Achievable yield in the dry season with good management practices




# IRRI Web and mobile phone applications in the Philippines


**Computer via Web connection**

[www.irri.org/nmrice](http://www.irri.org/nmrice)







- 1 Access web site
- 2 Answer 15 questions about field
3. Receive guideline via internet



**Mobile phone SMS compatible**

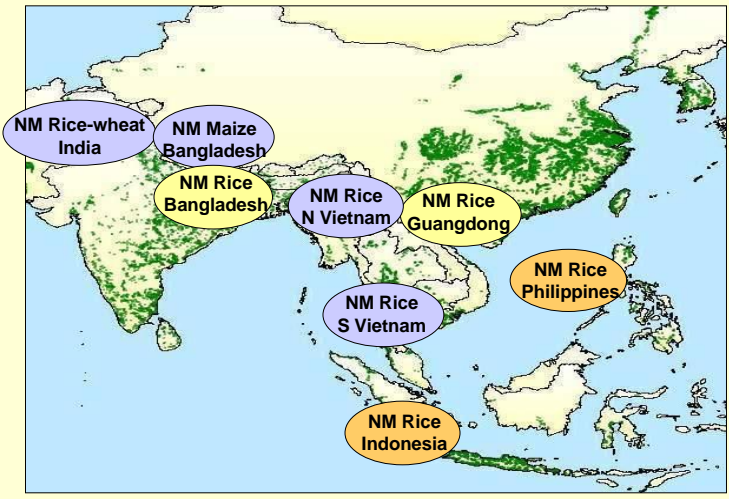
- 1 Call toll free number
- 2 Answer 12 questions about field
3. Receive guideline via text

**NMRice: For 94-105 sacks of palya on 1 hectare in dry season w/ good management practices: Apply 3 bags 14-14-14 basal or w/in 10 days after transplanting (DAT), 1 bag urea at 21 to 25 DAT, 1 bag urea at 30 to 34 DAT.**

**Text message from web application under development**

# IRRI Status of Nutrient Manager decision tools

● Released    
 ● Field verification    
 ● Under development



**IRRI**

**The development of SSNM and decision-making tools was made possible through long-term support from**

- **Swiss Agency for Development and Cooperation (SDC)**
- **International Fertilizer Industry Association (IFA)**
- **International Plant Nutrition Institute (IPNI)**
- **International Potash Institute (IPI)**

Rice  
Science  
for a Better  
World