

## The expansion of rice-maize systems in Asia: anticipated impact on fertilizer demand

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A joint mission with the International Potash Institute (IPI)

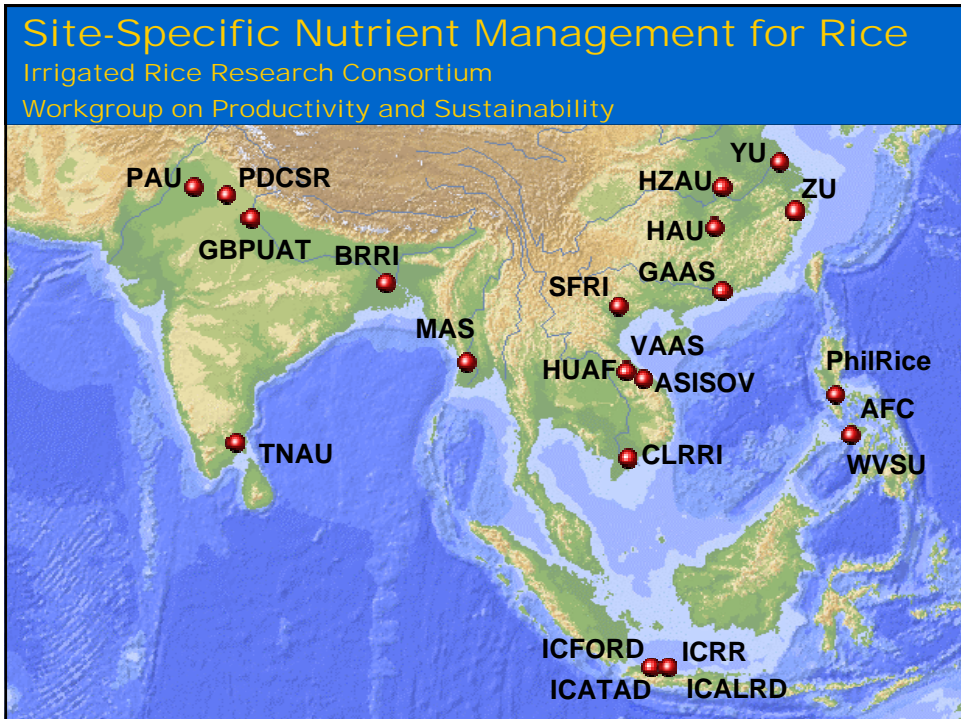
## Outline

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- Update on regional activities in rice and maize
- Rice-maize systems in Asia
  - Current status and future potential
  - New strategic research alliance on rice-maize
  - Ecological intensification
- Expected impact of increased cropping intensity on fertilizer demand
  - Cropping intensity (change rotation, more crops), production levels, nutrient demand, fertilizer need
  - Case study: Expansion of rice-maize in Bangladesh
- Conclusions



Regional activities: SSNM for Rice



# Recent developments: Rice

## Indonesia

- In January, Indonesian government established an urgent **Rice Intensification Program** for 2007
- In March, Indonesia developed a bilateral agreement with IIRI aiming at 10 Mio US\$ for a 5-year **project for rice intensification**
- In May, the Indonesian fertilizer workgroup in partnership with IIRI and IPNI developed a **national concept on SSNM for Rice** in Indonesia. Training materials are under development for implementation at provincial and district level.

## Vietnam

- Request by the newly formed Vietnamese Academy for Agricultural Sciences (VAAS) to assist in the development of **concepts for integrated crop management** in rice and maize based on Site-Specific Nutrient Management approaches developed in partnership with IIRI and IPNI.
- Joint workshop of VAAS, IIRI, and IPNI in early October 2007.

## Philippines

- Development of a **national working group** on SSNM in rice and maize.

## Thailand

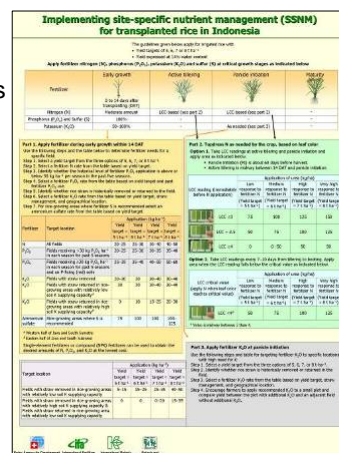
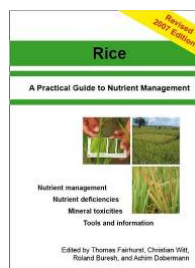
- Discussion on joint activities of IIRI with **Department of Agricultural Extension**

Witt 2007



# Outputs

- Locally adapted SSNM guidelines for 17 locations in 7 countries
- Simplified 1-page recommendations
- Training materials
- Practical guide 2<sup>nd</sup> edition in several translations
- Launch of SSNM web sites



[www.irri.org/irrc/ssnm](http://www.irri.org/irrc/ssnm)  
[www.irri.org/irrc/ssnmrice](http://www.irri.org/irrc/ssnmrice)





Regional activities: SSNM for Maize

## Site-Specific Nutrient Management for Maize Southeast Asia Program (SEAP) of IPNI

### Indonesia

IAARD, ICFORD, AIAT,  
IPNI, University of  
Nebraska

### Vietnam

IAS, NISF, Cantho  
University, CLRR, I,  
WASI, IPNI

### Philippines

UPLB Corn RDE  
network, PhilRice, DA,  
IPNI

- ★ 2004-2007
- ★ 2005-2007
- ★ 2005-2007



## Maize Activities 2007/08

- 2 collaborator workshops and 1 national workshop per country and year
- Regional Maize Workshop in Indonesia 2008 organized by CIMMYT
- 120 field trials in 19 provinces with farmer participation (1000-2000 farmers participating in 2007/08)
- Farmers meetings in 19 provinces



## Rice-maize systems in Asia

Country	Area (Mio ha)		
	Rice	Maize	R-M
Philippines	4.2	2.6	0.12
Indonesia	11.8	3.5	1.55
Vietnam	7.3	1.1	0.32**
China	29.1	26.4	-
Thailand	10.0	1.1	0.04**
India	43.4	7.8	0.41
<b>Bangladesh</b>	<b>10.5</b>	<b>0.1</b>	<b>0.08</b>
Nepal	1.6	0.9	0.43**
Total	117.9	43.9	2.96

Source: Timsina, 2007, FAO 2005 \*\*estimated from CIMMYT-IFAD Reports



	<u>Current</u>	<input type="checkbox"/> <u>Opportunities for maize</u>
<b>Central Luzon</b>	Rice-Rice	
<b>Central Thailand</b>	Rice-Rice	
<b>South Vietnam</b>	Rice-Rice-Rice	
<b>West Java</b>	Rice-Rice	
<b>South India</b>	Rice-Rice-Pulses	
<b>South China</b>	Rice-Rice	
<b>North India</b>	Rice-Wheat	
<b>North Vietnam</b>	Rice-Rice-Maize	
<b>C. and E. Java</b>	Rice-Rice-Maize	

Source: IRRI, 2006

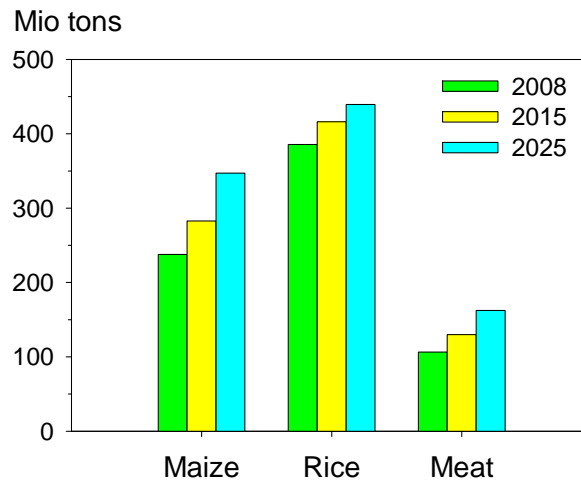
## Drivers of change

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- Rapidly rising demand for maize for feed and biofuel
- Declining availability of irrigation water
- Short duration maize hybrids with high yield & income potential
- Rapidly expanding agri-business sector associated with maize seed markets, other production inputs, and processing & marketing of maize products

Source: Timsina, 2007

## Demand projections for Asia



IFPRI, IMPACT-D model, 2007



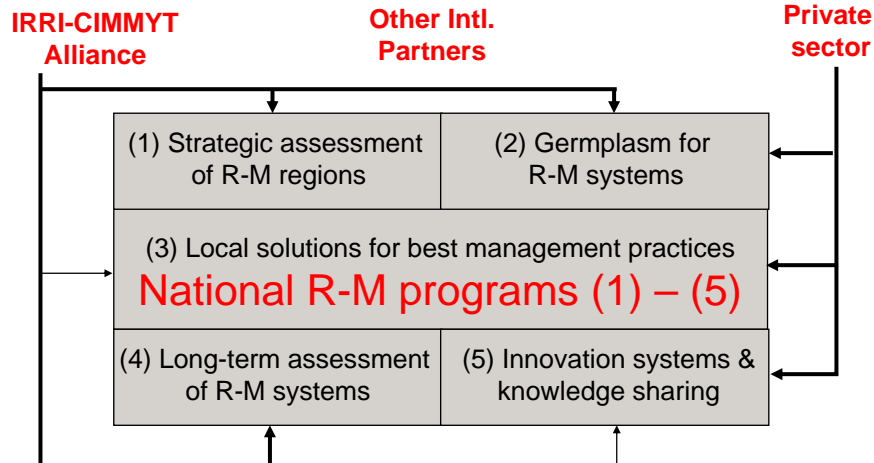
## Key issues for R-M systems in Asia

- Expansion despite insufficient understanding of their potential, constraints, and risks
- Uncertainty about their long-term performance and sustainability
- Dominance of commodity-specific research and lack of R&D support for system-level research
- Insufficient partnerships at an international level & within countries
- Large role of private sector in expansion of R-M systems and dissemination of knowledge & new technologies



## A new strategic alliance on rice-maize

### Intensive Production Systems in Asia (IPSA)



## IPSA Strategic Assessment

- Identify & describe existing cropping systems
- Analyze long-term climate & its variability, including extremes
- Analyze bio-physical constraints in the existing systems
- Estimate yield potentials of component crops using simulation models
- Optimize alternative (& potential) systems considering Yp & bio-physical constraints
- Consider socio-economic constraints (e.g., input & output prices, markets, labor, etc.)



## Ecological Intensification

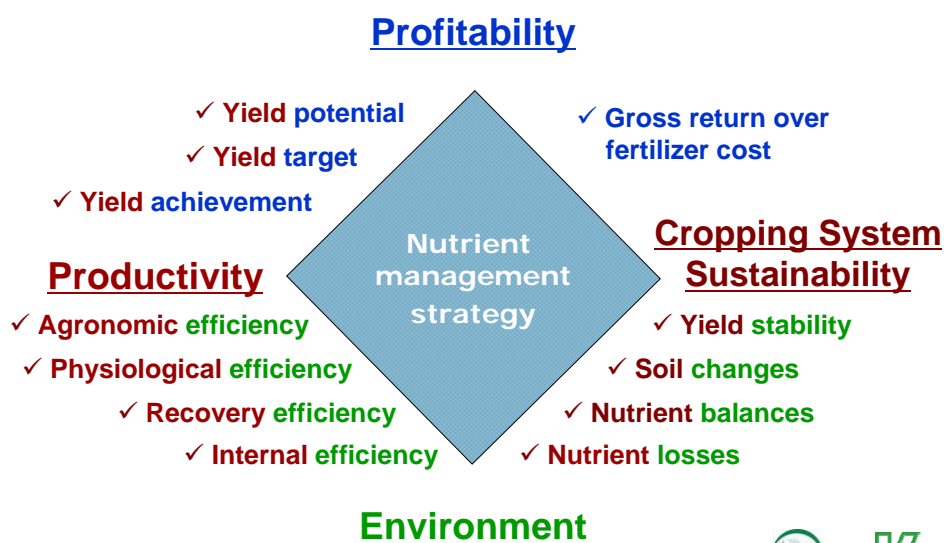
*At issue is whether further intensification of cereal production systems can be achieved that satisfy the anticipated increase in food demand while meeting acceptable standards of environmental quality. This goal can be described as an **ecological intensification** of agriculture. Success will depend on sustaining yield increases in the existing major irrigated and favorable rain-fed cereal systems because of limited opportunity for greater cropping intensity and expansion of irrigated area.*

Kenneth G. Cassman

Proc. Natl. Acad. Sci. USA  
Vol. 96, pp. 5952-5959, May 1999  
Colloquium paper



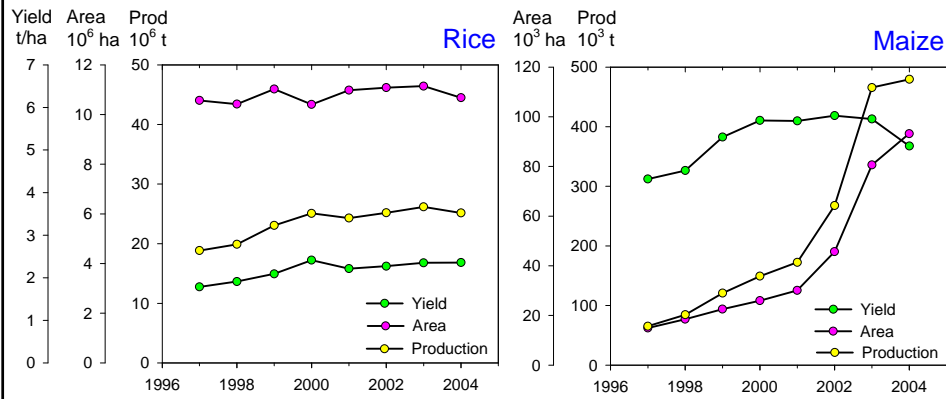
## Framework for evaluation



Witt 2003



## Case study: Bangladesh



Source: Bangladesh Agriculture Statistics, 2005  
Ali et al, 2007



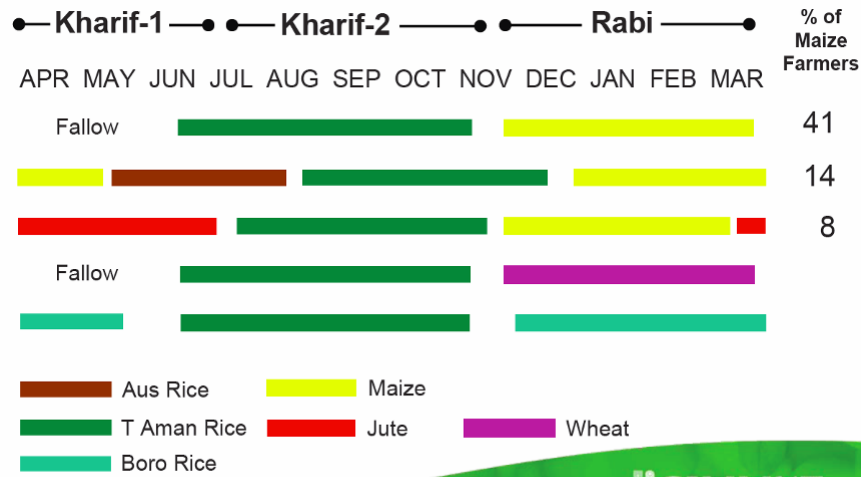
## Case study: Bangladesh

### Projections:

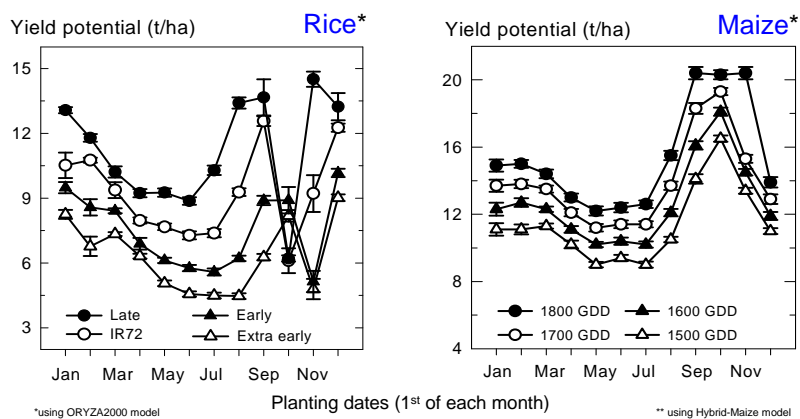
- Rice area in 2016/17: increase to 11.6 Mio ha; +5% from 2004 (FAPRI, 2007)
- Maize area in 2010: increase to 200,000 ha; +46% from 2004 (Waddington et al 2006)



## Major rice-maize and other cereal cropping patterns in Bangladesh



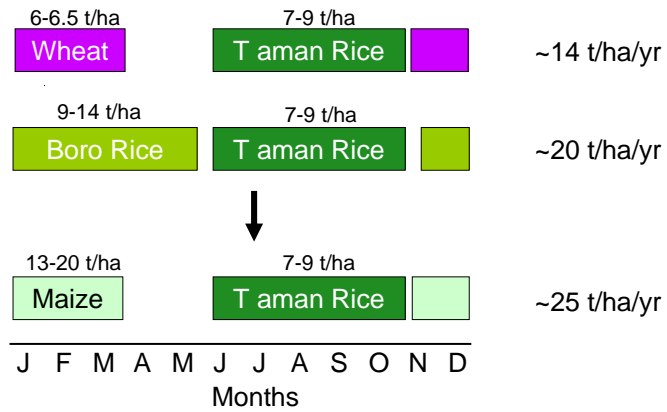
## Case study: Dinajpur, NW Bangladesh



Long-term simulated potential yield  
Source: Timsina, 2007



## Case study: Dinajpur, NW Bangladesh



Production potential of cropping systems



## Case study: Dinajpur, NW Bangladesh

Cropping system	Monsoon rice	Winter crops	Total yield
R-R	4.2	5.5	9.7
R-W	4.2	3.3	7.5
R-M	4.2	8.0	12.2

Average farmers' yield (t/ha)

Source: Y. Ali, BARI (unpublished data)



## Case study: Dinajpur, NW Bangladesh

Fertilizer	Monsoon rice	Boro rice	Wheat	Winter maize
N	105	117	105	233
P <sub>2</sub> O <sub>5</sub>	28	58	46	80
K <sub>2</sub> O	9	45	30	81

Current farmers' fertilizer use (kg/ha)

Source: Y. Ali, BARI (unpublished data)



## Case study: Dinajpur, NW Bangladesh

Cropping system	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
R-R	222	86	54
R-W	210	74	39
R-M	338	108	90

Estimated farmers' fertilizer use (kg/ha)

Source: Modified after Y. Ali, BARI (unpublished data)



## Conclusions: Technology development

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- International organizations (IRRI, CIMMYT, IPNI) and national partners are well positioned and work together
- Concepts and technologies are available to respond to rapid change in some countries
- Concepts and tools to design and evaluate alternative cropping systems are available



## Conclusions: Fertilizer demand

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- Moderate impact on fertilizer demand when changing from R-R or R-W to R-M
- Fertilizer demand increases more significantly where a new crop is introduced.



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Thank you.