IFA International Workshop
Fertilizer Best Management Practices
Brussels, 7-9 March 2007

National/regional case study: Southeast Asia

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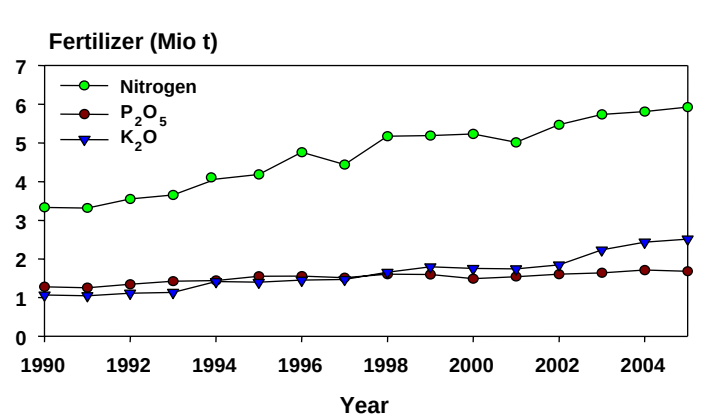
Southeast Asian countries

- Cambodia
- Indonesia
- Lao PDR
- Malaysia
- Myanmar
- Philippines
- Thailand
- Vietnam

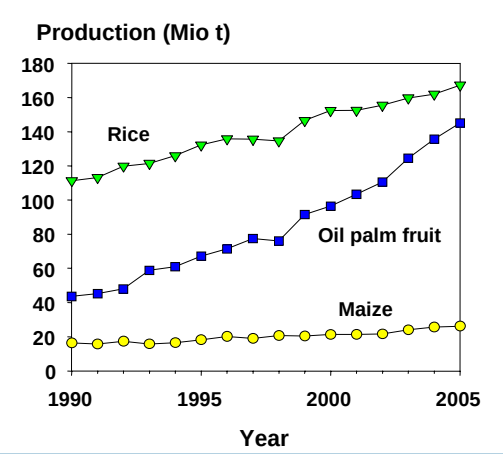
Fertilizer consumption in Southeast Asia



Source: IFA 2006

IPNI-IPI SE Asia

Total production of rice, maize, and oil palm fruit in Southeast Asia



Source: FAOSTAT. Assessed 22 February 2007

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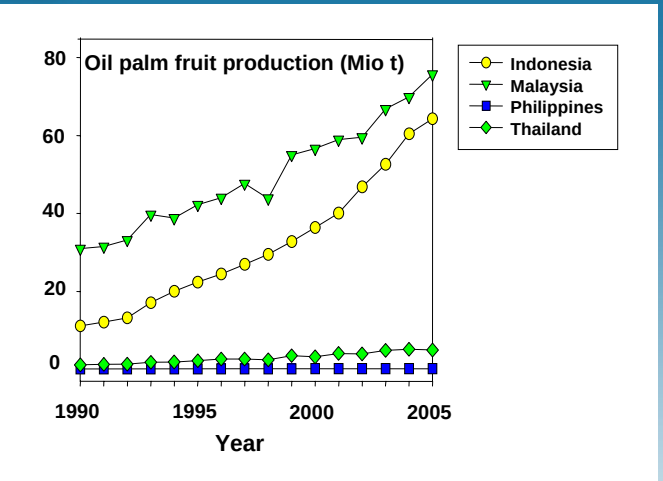
Oil palm fruit production for individual Southeast Asia countries



Source: FAOSTAT. Assessed 22 February 2007

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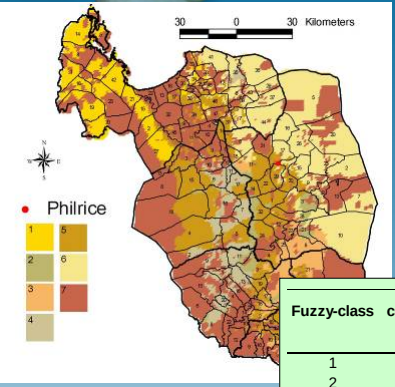
Key crop and nutrient management principles for oil palm

1. Decision making based on relevant information
2. Development of management units based on soil and plant surveys
3. Best management practice for optimal economic yield
4. Plant-based determination of nutrient needs
5. 'Need-based' fertilizer use for effective use of nutrients

Understanding variability

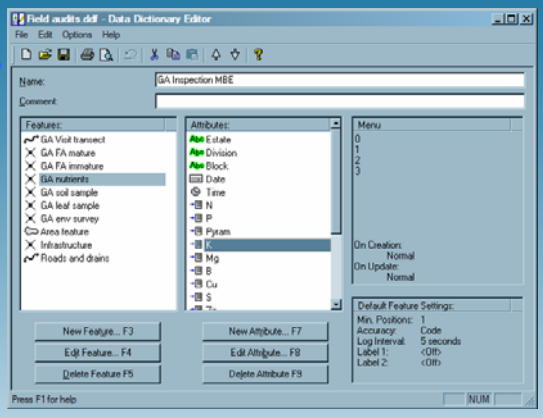


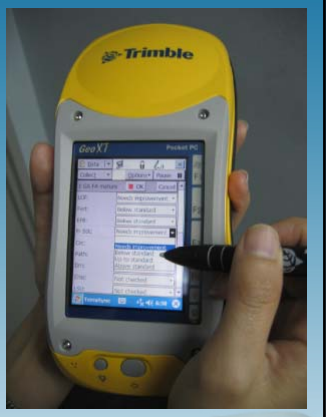
Reclassify relevant information (soil properties, yield) using geo-statistics and GIS approaches to develop larger domains.

Fuzzy-class	count	pH	sand (%)	clay (%)	Grain yield (t ha^{-1})	
					1999 DS	1999 WS
		Mean ± SD				
1	1394	6.2 ± 0.2	42 ± 9	37 ± 8	3.2 ± 0.7	2.5 ± 0.9
2	762	5.3 ± 0.7	29 ± 16	35 ± 11	4.2 ± 0.6	3.8 ± 0.7
3	985	6.2 ± 0.5	26 ± 4	55 ± 7	4.0 ± 0.7	3.8 ± 0.6
4	1106	5.7 ± 0.4	76 ± 11	12 ± 7	4.0 ± 0.6	3.8 ± 0.5
5	3054	6.8 ± 0.4	37 ± 11	29 ± 6	4.2 ± 0.7	3.7 ± 0.7
6	3906	6.3 ± 0.4	35 ± 11	36 ± 8	4.1 ± 0.8	3.5 ± 0.7
7	No data					

Principle 2 – Development of Management Units

Geo-referenced data collection



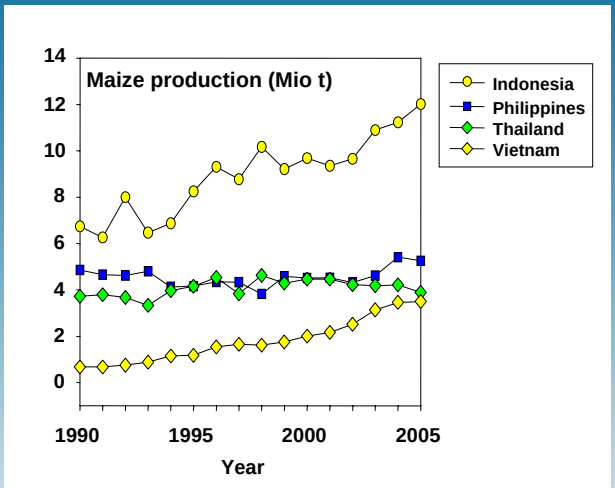


Principle 2 – Development of Management Units

Potential for adoption of FBMPs for oil palm

- Very high
  - Fertilizer comprises high portion of the variable cost in intensively managed plantation crops
  - Considerable receptivity to new technologies
  - New technologies can be implemented at large scale

Maize production for individual Southeast Asia countries



Source: FAOSTAT. Assessed 22 February 2007

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Hybrid seed companies are source of fertilizer information for maize farmers

- Location-specific nutrient problems can be missed : Example of P needs on andisol in N. Sumatra

- SEAP IPNI & IPI is coordinating a project developing SSNM for maize

Use of SSNM to estimate total fertilizer N requirement for maize and rice

The efficiency of fertilizer N use is higher for maize than rice

N use efficiency (kg grain increase/kg N applied) →	25	33
Crop response to N (t/ha) ↓	Fertilizer N rate (kg/ha)	
1	40	30
2	80	60
3	120	90
4	160	120
5	200	150
6		180

High yielding maize can be a heavy fertilizer user

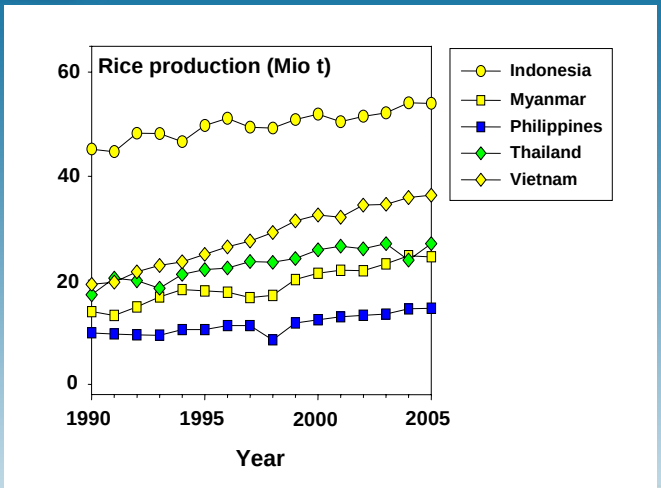
The efficiency of fertilizer N use is higher for maize than rice in favorable irrigated environments, but fertilizer needs can be high

Crop	Yield target (t/ha)	N-limited yield (t/ha)	Yield gap (t/ha)	AE (kg/kg)	Fertilizer N needed (kg/ha)	
					Per ton of response	Total
Rice	7	3	4	25	40	160
Maize	8	2	6	33	30	180

Potential for adoption of FBMPs for maize

- High, especially when a relatively new crop' for farmers
  - Limited sources of fertilizer information to farmers
  - Relatively high demand for information

Rice production for individual Southeast Asia countries



Source: FAOSTAT. Assessed 22 February 2007

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Contrasting messages and recommendations for extension and farmers can cause confusion and affect adoption

- **Extension and farmers can get such diverse messages as:**
  - **Use organic materials**
  - **Use specific fertilizer sources**
  - **Use soil testing**
  - **Use leaf color charts***
  - **Use official blanket recommendation**
  - **Use SSNM**

***Distribution of LCCs without training of farmers typically does not work.**

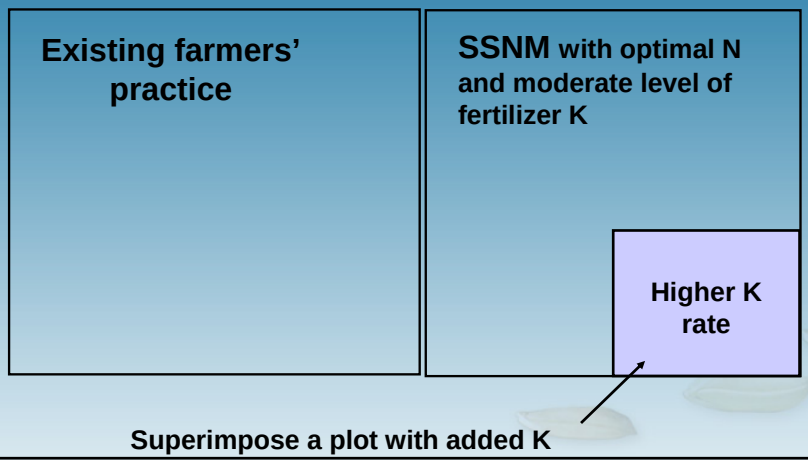
A commitment to research can make a difference in providing new concepts

Contributions of SSNM to new concepts in rice fertilization

	1987	2007
Key message	'Reduce N loss'	'Feed crop needs'
Total N rate	Fixed by season	Determined by N response and AEN
Key N component	Basal incorporation	'Moderate' early N, variable within season rate
Key efficiency parameter	Recovery efficiency	Agronomic efficiency
PK rate	Fixed	Decision support, input = output
K application	All basal	Split, enable farmer experimentation

Challenge of providing a profitable K recommendation when crop does not respond to K despite K mining

Encourage farmers to evaluate their need for K



Evaluate the effect of added K on grain filling

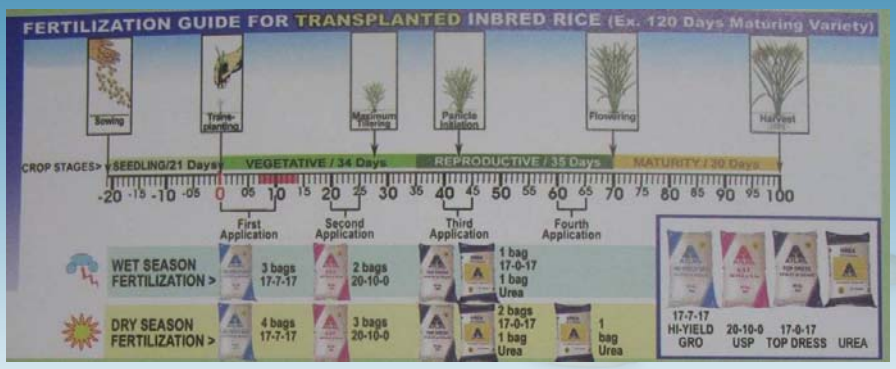
Collect panicles from plots

Compare grain filling

Low K **High K**

Example of the fertilizer industry in development and promotion in Philippines

- **Company approached IRRI for up-to-date information**
- **Tailored use of their sources to SSNM guidelines**



Experiences with soil testing

- Flooding a soil changes soil chemistry and nutrient availability
- Effectiveness of soil testing can be quite different on flooded rice soils than non-rice soils

	Experiences with rice	Alternatives
N	No relationship between soil analysis and yield without N	Estimate based on texture, organic inputs & cropping
P	Flooding increases P availability	Use past fertilizer P use
K	Crop responses to K when soil K is above critical level	Mineralogy & use of K addition plots
Zn	Labs with reliable analyses often not readily available	Use of Zn addition plots

Key ingredients to successful development, promotion, and adoption of FBMPs

- Sound science-based concepts
- Involvement of stakeholders from the beginning
- Strong partnerships across research and extension
- Consistent, simple, science-based principles (messages) for end users
- Participation and empowerment of farmers
- Strong institutional linkages
- Technical experts well trained in current concepts and able to facilitate training and dissemination
- Long-term funding

Potential for adoption of FBMPs for rice

High: Key factors will be

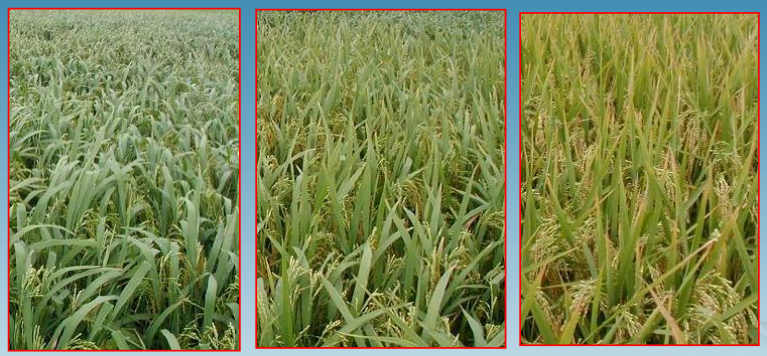
- Strong institutional partnerships for developing and disseminating recommendation
- Well trained technical experts with up-to-date concepts and ability to facilitate local training and dissemination

A key ingredient to success: The long-term commitment of donors to research enabling the development and extension of new science-based concepts

- The development, evaluation, and extension of a new plant-based concept of SSNM rice, which has serves as a model for other crops, was possible because of a decade of support from
  - IFA
  - IPNI
  - IPI

Observations of rice canopy (architecture) in field experiments

Unhealthy → Healthy canopy



Photos provided by Shaobing Peng

Sheath blight disease

Management can strongly influence crop canopy and disease