

Role of Soil Testing in Site Specific Nutrient Management

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Asia Program Coordinator



IPNI Replaces PPI/PPIC

- IPNI was announced on November 1, and officially begins January 1, 2007.
- IPNI is a new organization which will focus on N, P, K, S and other nutrients in global cropping systems and the environment.
- All PPI/PPIC staff are now part of IPNI.
- International support from industry.



IPNI Member Companies

- Agrium Inc.
- Arab Potash Co.
- Belarusian Potash Co.
- Bunge Fertilizantes S.A.
- CF Industries Holding, Inc.
- Groupe OCP
- Intrepid Mining, LLC
- K+S KALI GmbH
- Mosaic
- PotashCorp
- Saskferco
- Simplot
- Sinochem Hong Kong Ltd.
- Spur Ventures Inc.
- SQM
- Terra Industries Inc.
- Uralkali



Why Soil Test?

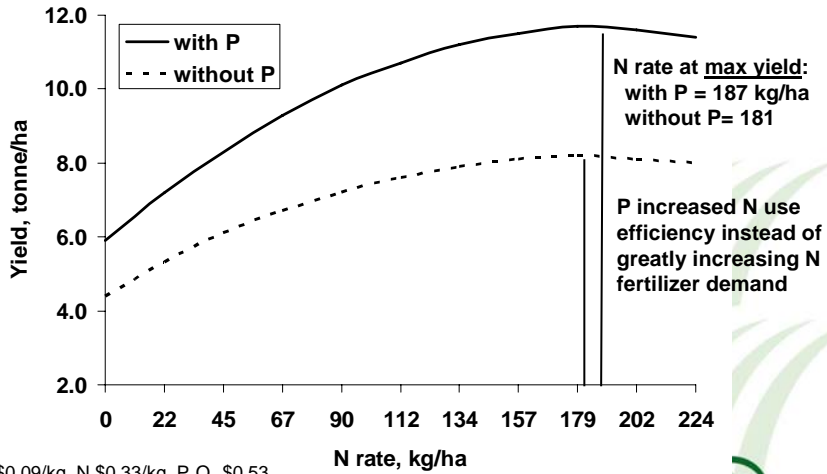


- To determine the soil nutrient status
- Identify which plant nutrients are deficient
- Avoid over, or under, fertilization





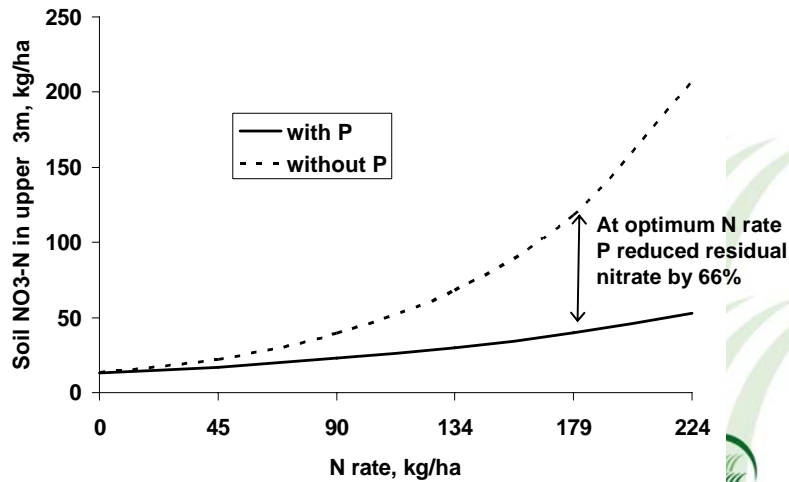
N and P on 30-year corn yield (Tribune, Kansas)



Corn \$0.09/kg, N \$0.33/kg, P₂O₅ \$0.53
 other costs \$528/ha
 Schlegel, Dhuyvetter, and Havlin, 1996. JPA 9:1
 30 year average



P impact on nitrate leaching after 30 years (Tribune, Kansas)



Schlegel, Dhuyvetter, and Havlin, 1996. JPA 9:1



Soil Testing Challenges

- Collecting and submitting a representative sample
- Selecting a lab with suitable extraction methods for your farms area
- Selecting a lab with appropriate interpretation of results (low/med/high)
- Recommendation philosophy – is it suitable for your farm?



Soil Testing Challenges in Asia

- Is there even a lab which you can send soil samples to for analysis?
- Are the labs available any good...?
- Can you afford to analyze soil samples?
- Do you have support to help in interpretation of lab results?



What can we expect from soil sample analysis?

- Information on soil nutrient supply, nothing more or less.
- Remember, recommendations are averages, not field specific.
- Ideally, these supply numbers would be used to develop specific recommendations for your farm.



Nutrient Assessment Approaches being used in Asia



China Program



Northcentral China
Dr. HE, Ping

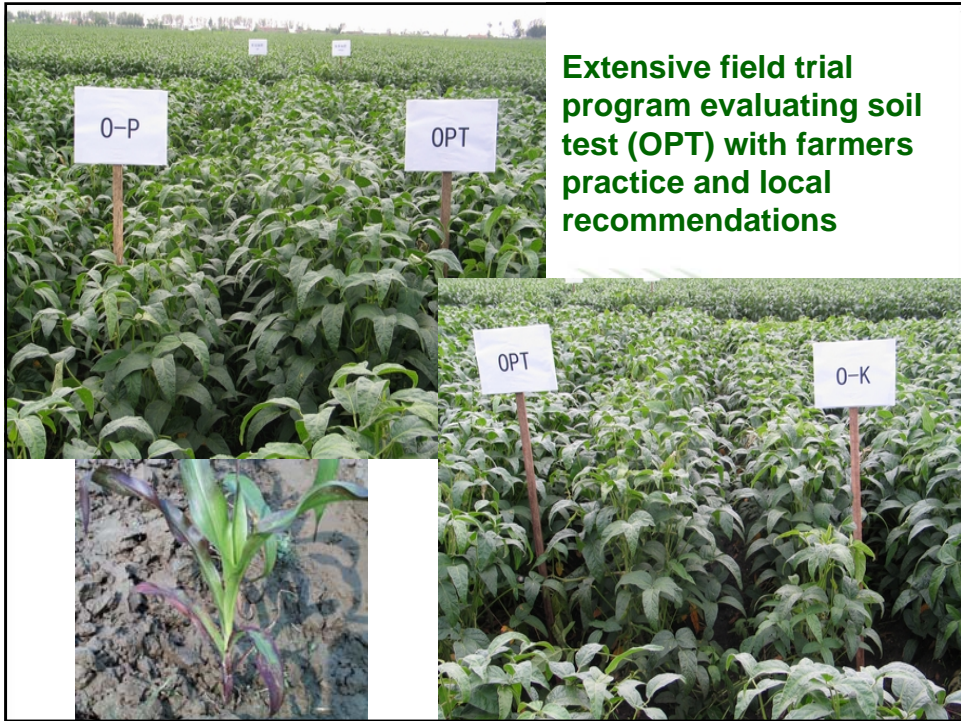
Northwest China
Dr. LI, Shutian

Southwest China
Dr. TU, Shiwua

Southeast China
Dr. CHEN, Fang

Northeast China
Dr. JIN, Jiyun
Director





Extensive field trial program evaluating soil test (OPT) with farmers practice and local recommendations

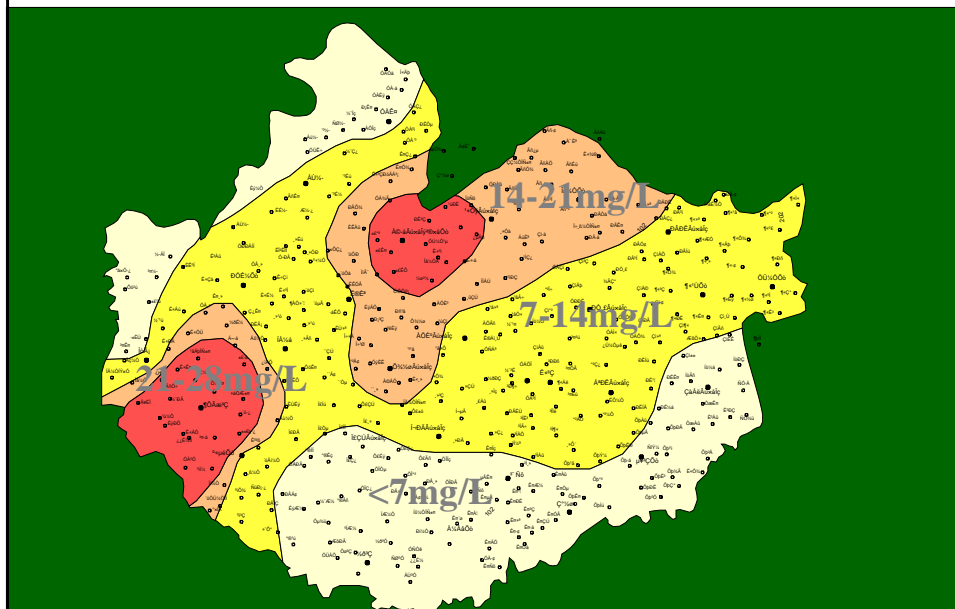


The CAAS-IPNI Soil and Plan Analysis Lab, founded in 1990, was named as National Lab for Soil Testing and Fertilizer Recommendation in China in 2005.

- In 2005, the Chinese central government provided total of 200 mill RMB (\$25 mill USD) to support soil testing and fertilizer recommendation in 200 counties
- In 2006, 700 mill RMB (\$88 mill USD) has been allocated to support soil testing and fertilizer recommendation in 700 counties

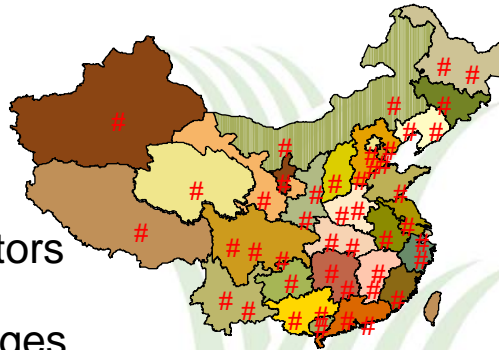


Soil testing (soil P map) helped to improve fertilizer use in Shuangcheng of Heilongjiang



Monitored villages

- 45 villages in 31 provinces
- 200-400 soil samples/village
- Soil nutrient maps developed
- Nutrient limiting factors identified
- SSNM in all 45 villages started

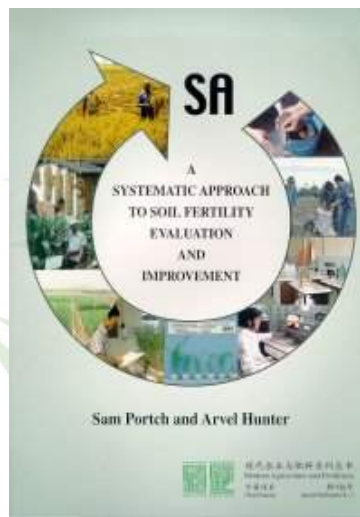


- Monitored village ... a model to test research, demonstrate BF technologies, OPT, and extend to surrounding areas



Systematic Approach & SSNM

1. Sorption studies of macro-, secondary & micro-nutrients
2. Greenhouse studies to establish optimum nutrient rates
3. Field verification trials
4. Conducting multi-location trials in farmer's fields comparing current state rec's, SSNM rec's, & farmers' practice



Omission Plot Technique

Treatments	N-P2O5-K2O-Zn	Yield (kg/ha)	%
OPT (soil test optimized)	180-90-150-5.25	7566	100
OPT-Zn	180-90-150-0	7254	95.9
OPT-N	0-90-150-5.25	5540	73.2
OPT-P	180-0-150-5.25	7104	93.9
OPT-K	180-90-0-5.25	7079	93.6
CK	0-0-0-0	5240	69.3
Farmer practice	195-66-42-0	6435	85.1

Field trial in 2005, Lishi Town, Shayang county, Hubei, China. Hybrid middle rice, variety: Il you 838.



On-Farm Trials to Evaluate Soil Test Recommendations

Field demonstrations in 2006, Hubei, China. Hybrid late rice.

Treatments	N-P205-K20	Yield (kg/ha)	%
Soil test Rec	165-60-105	8751	100
CK	165-60	7044	81
Farmer practice	210-30-60	7677	88



Challenges in China

- Concerns over soil testing methods
- China program adopted a single multi-nutrient extractant...controversial.
- Speed and efficiency are traded off against more traditional methods, involving a number of extraction methods.
- Issue continues...soil testing being done.



India Program



Dr. K.N. Tiwari
North & West Zone
Director



Dr. K. Majumdar
East Zone



Dr. T.N. Rao
South Zone



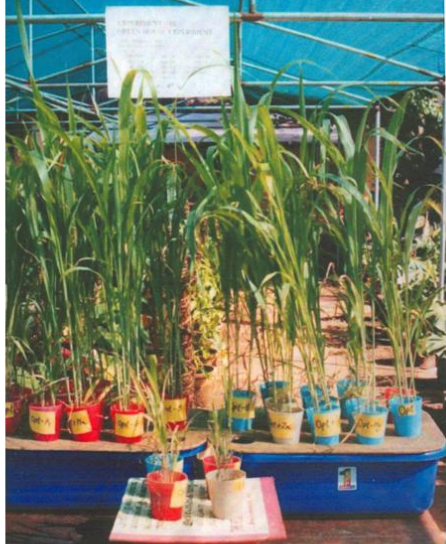
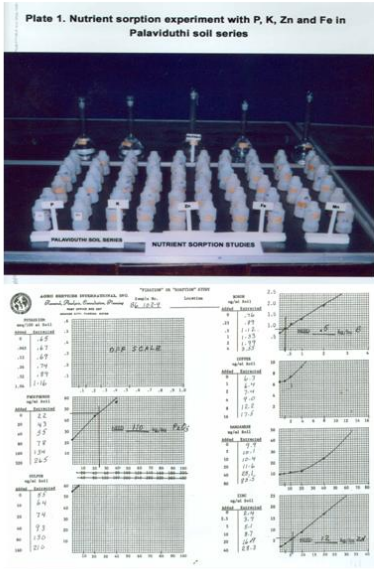
India and Soil Testing

- Systematic Approach for Soil Fertility Evaluation and Improvement
- Sending soil samples to Florida to ASL labs for analysis...why?
- Lack of confidence in Indian labs, and unable to get a full range of nutrients evaluated...S and mircos.





Modifications possible in soil fertility evaluation:
 Systematic Approach is capable of simultaneous evaluation of multi-nutrient situations



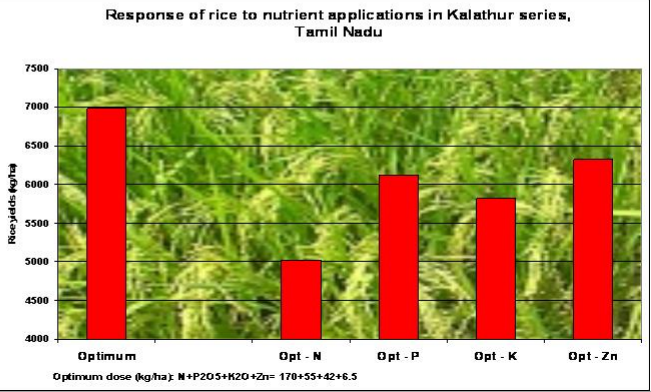
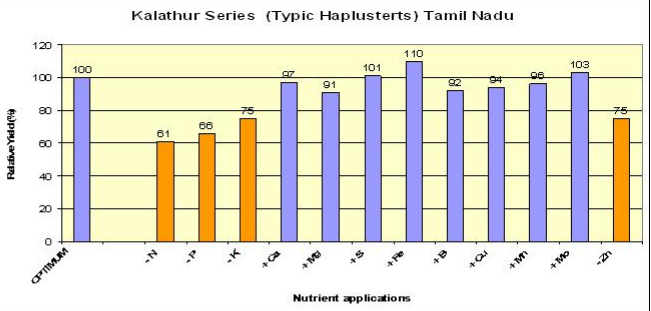
GREEN HOUSE EXPERIMENTS



Information based on sorption studies & green house studies:

Crop: Rice
 Establishing optimum nutrient doses through field experiments:

Source: Final Report (2001)– Systematic Approach for Evolving Fertilizer Optima in Rice Based Cropping Systems. TNAU-PPICIP research project. Project leader: Dr. V. Murugappan



Performance of soil test-based fertilizer application

Crop	Treatment	Targeted Yield (t/ha)	Fertilizer applied [(N : P ₂ O ₅ : K ₂ O) kg/ha]	Grain/ Fibre yield (t ha ⁻¹)	Net return (Rs/ha)
Jute (var.JRO-524)	STB	3.0	(200:50:100) kg ha ⁻¹ +30 kg S ha ⁻¹ +1.50 kg B ha ⁻¹	2.86	14848
	SR		50:25:50	2.40	13239
Winter rice (var.IET-5656)	STB	3.5	168:56:140	4.06	9909
	SR		60:30:30	3.02	6615
Summer rice (var.IET-4786)	STB	5.0	168:112:140+8.9 6 kg Zn ha ⁻¹ + 0.56kg B ha ⁻¹ +2.24 kg Cu ha ⁻¹	5.29	15555
	SR		100:50:50	3.02	10652

STB: Soil test-based fertilizer application, SR: The State Government recommendation

Source: Ghosh and Sanyal (2005)



On-farm trials with wheat, pearl millet and mustard, New Delhi

Farmer's name & village	Treatment*	Nutrient dose (kg ha ⁻¹)			Yield (kg ha ⁻¹)
		N	P ₂ O ₅	K ₂ O	
Wheat (HD-2329) Umrao Singh, Tatesar	STR target 5 t ha ⁻¹	110	76	51	5080
	SR	120	60	40	4720
Wheat (HD-2329) Bhan Singh, Tatesar	STR target 5 t ha ⁻¹	131	22	57	4720
	SR	120	60	40	4400
Wheat (HD-2329) Rajvir Singh, Jonti	STR target 5 t ha ⁻¹	140	28	35	5150
	SR	120	60	40	4700
Wheat (HD-2329) Raghubir Singh, Panjabkhor	STR target 5 t ha ⁻¹	123	70	21	4600
	SR	120	60	40	4450
Pearl millet Rajvir Singh, Jonti	STR target 2.5 t ha ⁻¹	106	61	25	2360
	SR	80	40	40	1880
Mustard (Pusa Jai Kisan) Sanjeet Singh, Tatesar	STR target 2.5 t ha ⁻¹	110	80	28	2344
	SR	120	40	40	1906

Source: Sharma *et al.* (1999)



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