



IPNI

INTERNATIONAL
PLANT NUTRITION
INSTITUTE

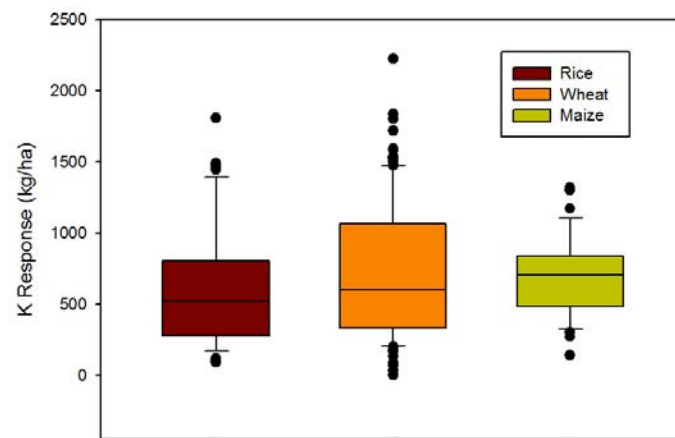
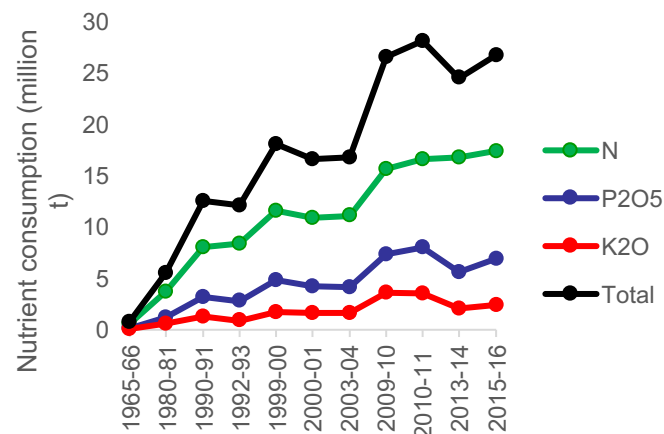
Socio-economic characteristics and resource endowment of smallholder farmers governs potassium fertilizer use and maize yield variability in India

*T. Satyanarayana, Ph. D
Director, IPNI South Asia Programme*

***Frontiers of Potassium an International Conference
January 25-27, 2017, Rome, Italy.***

K fertilizer use in India – Trends and Facts

- Potassium has long been considered as a neglected nutrient in Indian Agriculture
- Potash contributed to less than 10% of the total nutrient consumption in the country
- K response in India varied from 0.7 t/ha in wheat to almost 1.0 t/ha in rice and maize (Majumdar et al., 2012)
- IPNI NuGIS approach showed negative K balances in most of the states of India (Dutta et al., 2013)



Nutrient Expert® : Fertilizer Decision Support System for promoting better fertilizer recommendations



Nutrient Manager for Wheat - Start

Nutrient Expert for Wheat

Settings About Help Exit

Version 1.0

First time user? Working in a new location? Make sure to have the 'Settings' right!

Nutrient Expert for wheat helps you to:

- evaluate current nutrient management practices
- determine a meaningful yield goal based on attainable yield
- estimate fertilizer NPK rates required for the selected yield goal
- translate fertilizer NPK rates into fertilizer sources
- develop an application strategy for fertilizers (right rate, right source, right location, right time), and
- compare the expected or actual benefit of current and improved practices.

To start, click a button

Current FFP & Yield → SSNM Rates → Sources & Splitting → Profit Analysis

India - Beta Version (December 2013)

Nutrient Expert for Hybrid Maize

Settings About Help Exit

Version 1.01 (February 2010)

First time user? Working in a new location? Make sure to have the 'Settings' right!

Nutrient Expert for Hybrid Maize helps you to:

- develop an optimal planting density for your location
- evaluate current nutrient management practices
- determine a meaningful yield goal based on attainable yield
- estimate fertilizer NPK rates required for the selected yield goal
- translate fertilizer NPK rates into fertilizer sources
- develop an application strategy for fertilizers (right rate, right source, right location, right time), and
- compare the expected or actual benefit of current and improved practices.

To start, click a button

Current NM Practice → Planting Density → SSNM Rates → Sources & Splitting → Profit Analysis

India - Beta Version (February 2014)

Nutrient Expert® for Rice

Settings About Help Exit

First time user? Working in a new location? Make sure to have the 'Settings' right!

Nutrient Expert for Rice helps you to:

- evaluate current nutrient management practices
- determine a meaningful yield goal based on attainable yield
- estimate fertilizer NPK rates required for the selected yield goal
- translate fertilizer NPK rates into fertilizer sources
- develop an application strategy for fertilizers (right source, right rate, right time, right place), and
- compare the expected or actual benefit of current and improved practices.

To start, click a button

Current FFP & Yield → SSNM Rates → Sources & Splitting → Profit Analysis

Nutrient Expert® (NE) increased Yield and Profitability

Parameter	Unit	Effect of NE (NE – FFP)					
		Wheat (n = 701)		Maize (n = 412)		Rice (n = 323)	
Grain yield	t/ha	+0.79	***	+1.27	***	+1.16	***
Fertilizer N	kg/ha	-8	***	-6	ns	+26	***
Fertilizer P ₂ O ₅	kg/ha	-4	***	-16	***	-5	*
Fertilizer K ₂ O	kg/ha	+54	***	+22	***	+2	ns
Fertilizer cost	USD/ha	+17	***	-1	ns	+3	ns
Gross profit	USD/ha	+163	***	+256	***	+235	***

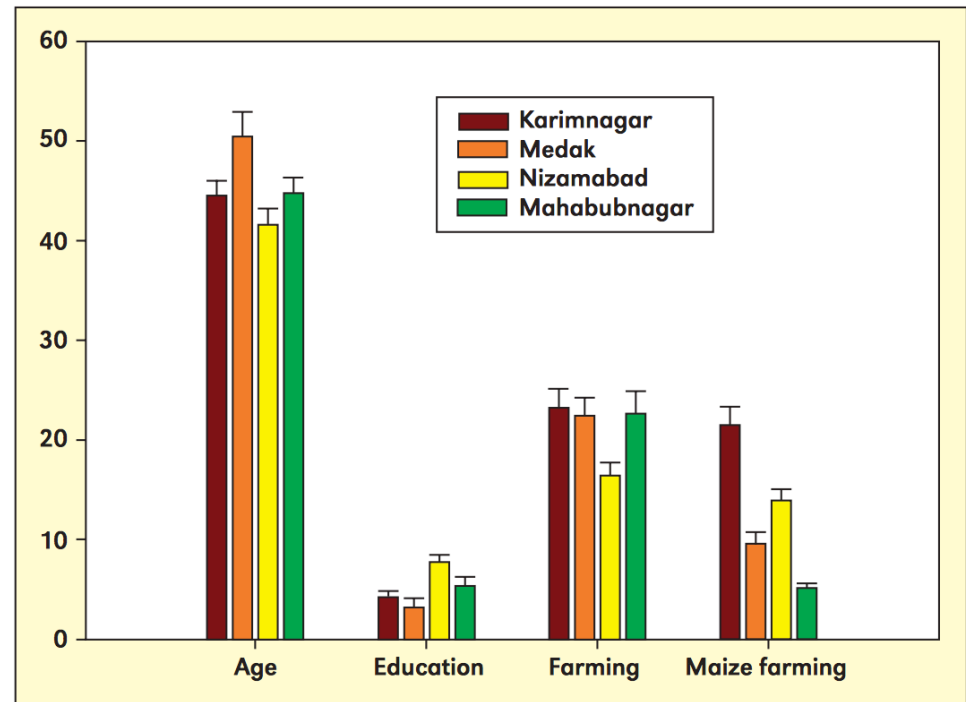
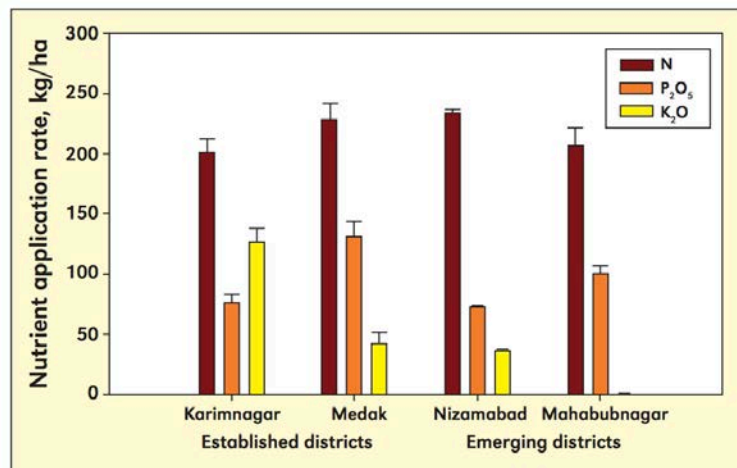
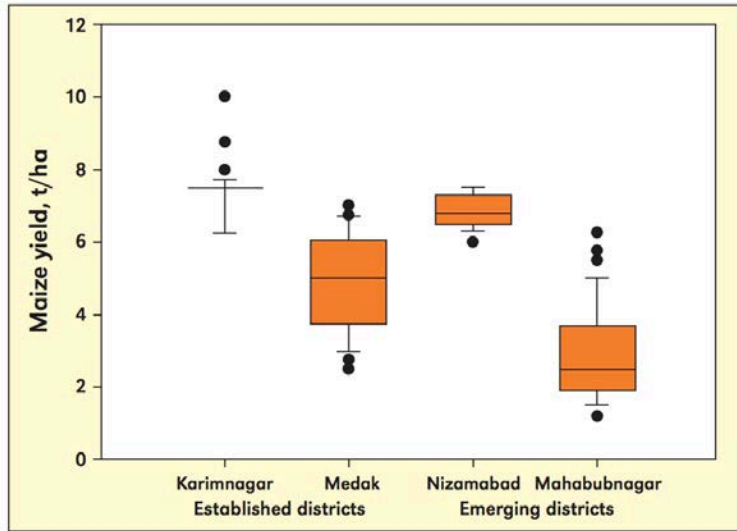
***, **, *: significant at <0.001, 0.01, and 0.05 level; ns = not significant

Integrating socio-economics and farmers' resource endowment with Nutrient Expert®



- The study was conducted in India and Nepal, 4 states in Eastern India; 2 states in Southern India; 2 districts in Eastern Terai of Nepal
- Two blocks in each state; Three villages in each block; 15 farmers in each village; Total 180 farmers in each state were covered
- Undertaken RRS and gathered information on maize yield, input use, farm size, livestock ownership, off-farm income, availability of family and hired labor etc.

Socio-economics governs maize yield variability and Fertilizer K use

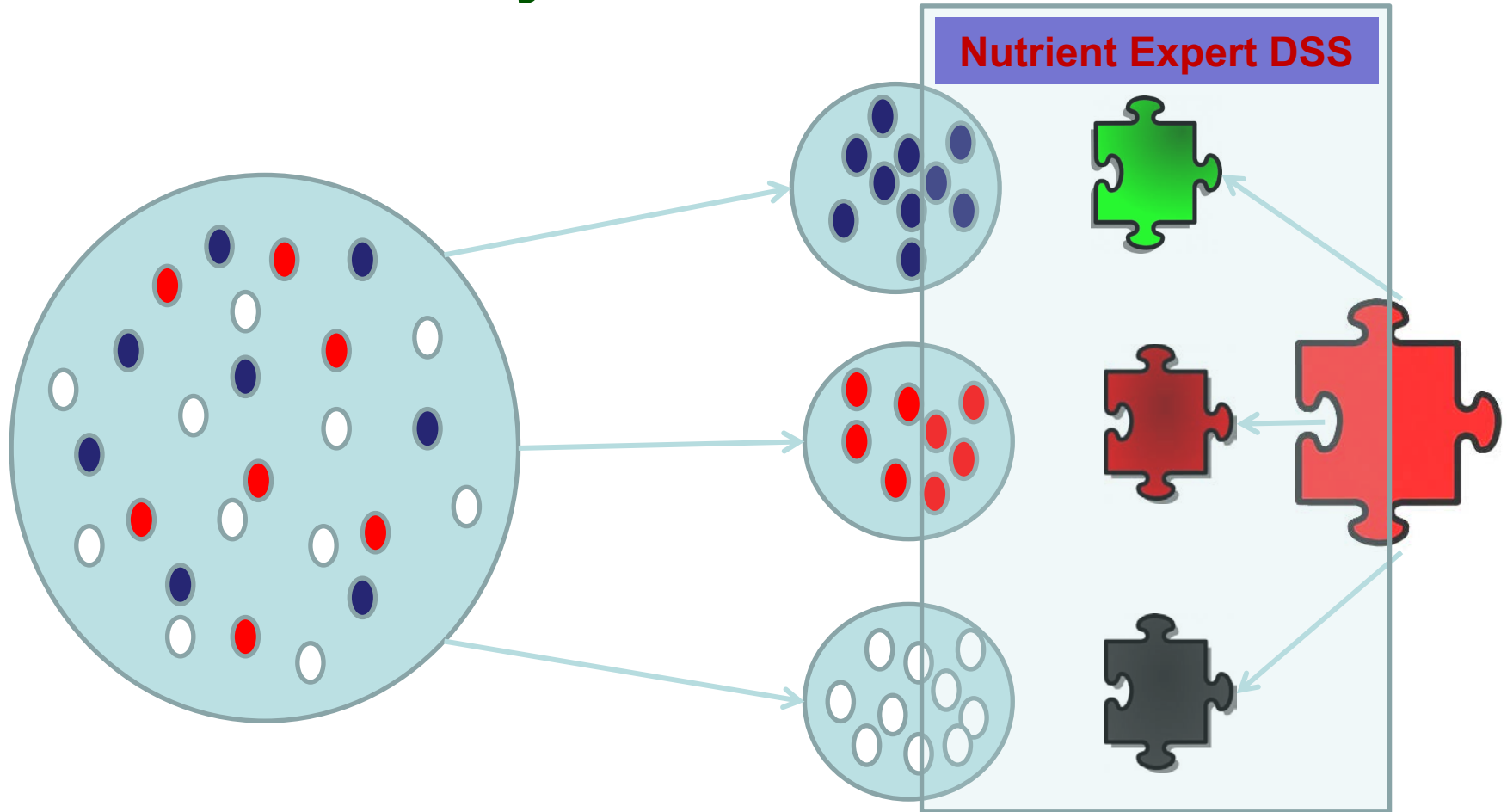


Resource endowment of farmers related to maize yield variability and Fertilizer K use

District	Parameter	Farm Income	Non-farm Income	Total Income	Farm Size
Karimnagar	Yield	0.76 [*]	-0.64 [*]	ns	ns
	K ₂ O	ns	ns	0.39 [*]	ns
Medak	Yield	ns	ns	ns	0.43 ^{**}
	K ₂ O	ns	-0.21 [*]	ns	-0.22 ^{**}
Nizamabad	Yield	-0.58 [*]	ns	-0.693 [*]	-0.84 [*]
	K ₂ O	0.42 ^{**}	ns	ns	0.49 [*]
Mahabubnagar	Yield	0.38 ^{**}	0.35 ^{**}	0.37 ^{**}	0.25 ^{**}
	K ₂ O	ns	ns	ns	ns

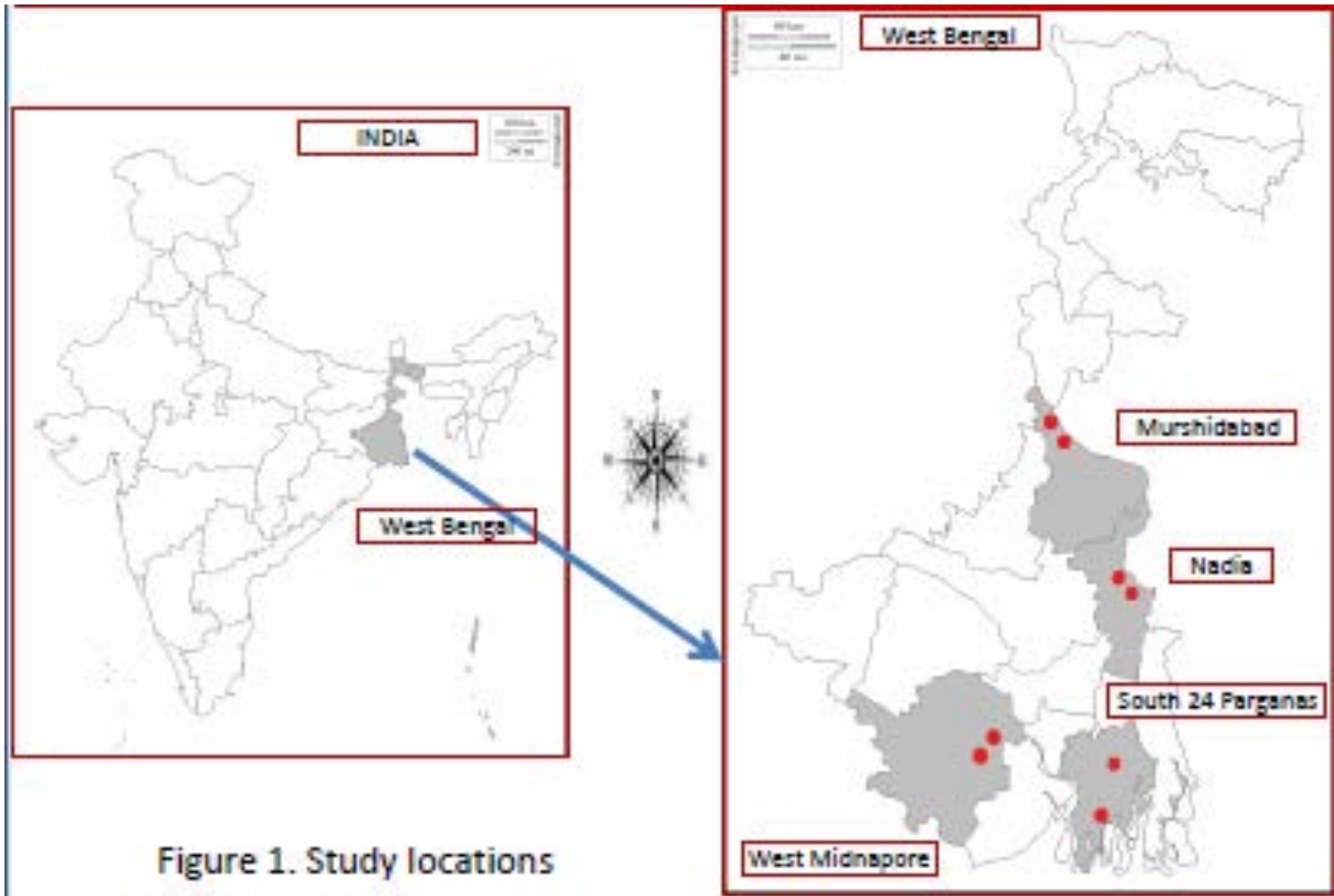
* Significant at 5% ** Significant at 1%

Typology delineation: Conceptual Framework for Technology Targeting in Smallholder Systems



Farm typology Flexible
recommendations

Farm typology delineation: Case study from West Bengal



Rapid Rural Survey, first step in typology delineation



Baruipur, South 24 Parganas



Patharpratima, South 24 Parganas



Kulgachhi, Nadia

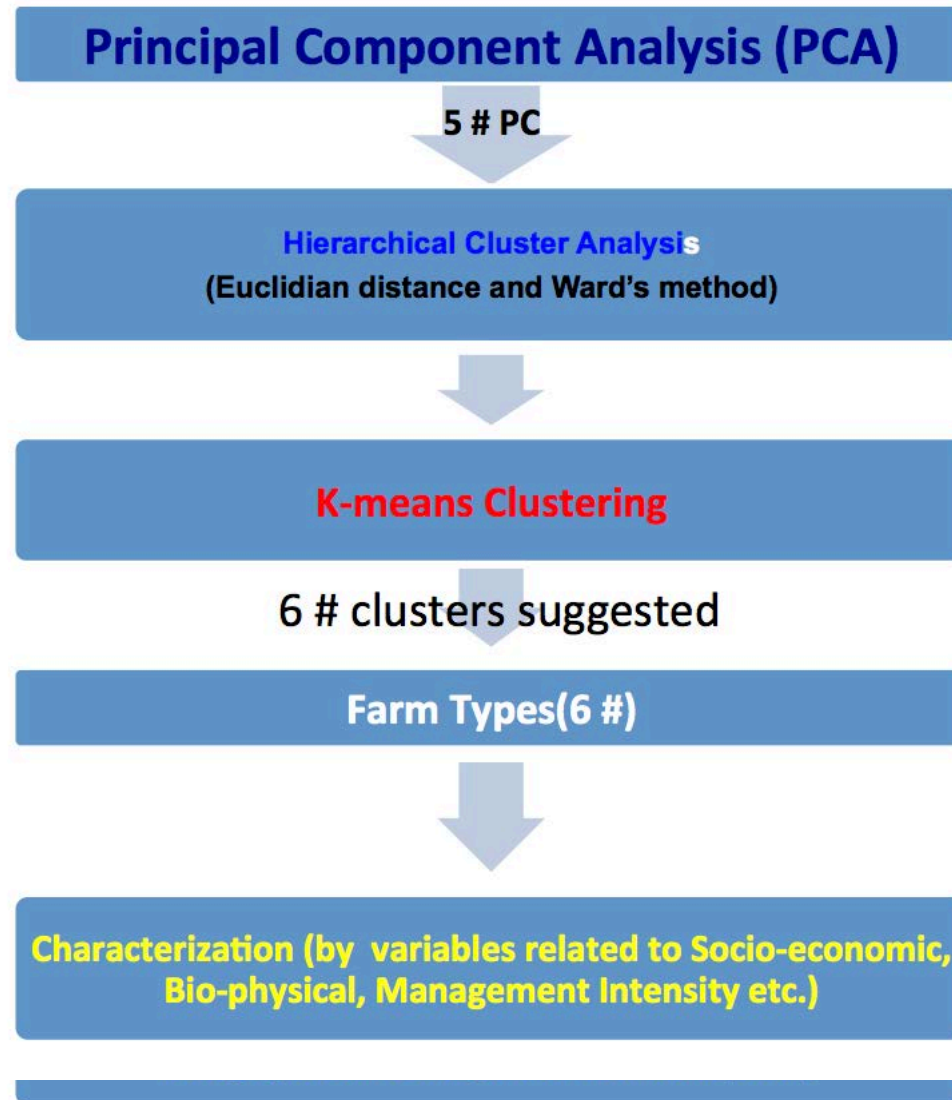


Keshpur, West Medinipur



Lalgola, Murshidabad

Methodology of farm typology delineation



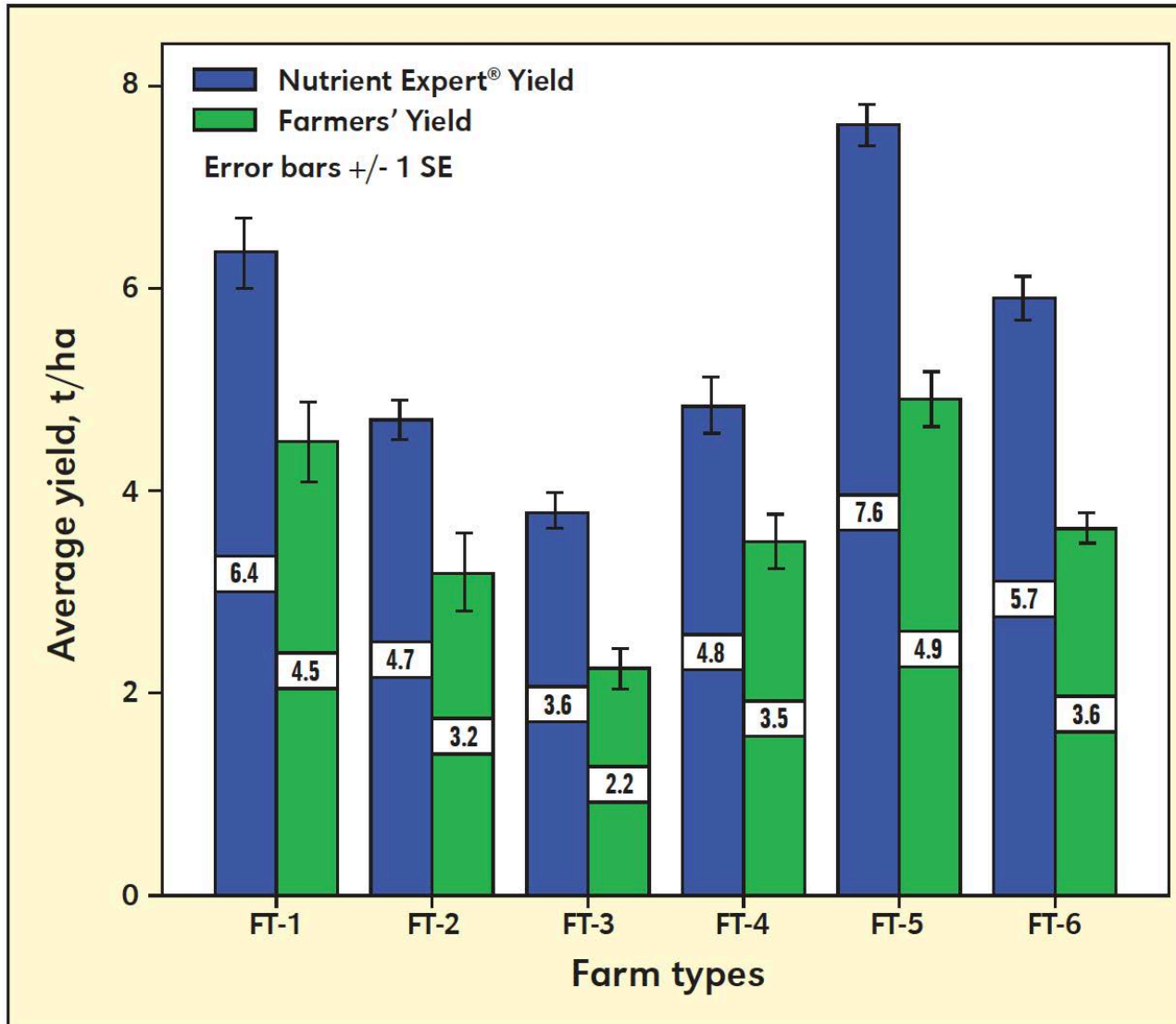
(Banerjee et al., 2014; Goswami et al. 2014)

Fertilizer recommendations using Nutrient Expert[®] across different farm types

Nutrients	Treatments	Farm Type 1 (Moderate-resourced commercial maize grower)	Farm Type 2 (Exclusive cultivators with large holding and large family)	Farm Type 3 (Low-yielding new maize growers)	Farm Type 4 (Moderately resourced family farms)	Farm Type 5 (Traditional maize grower)	Farm Type 6 (Resource-rich commercial seed producers)
N	FFP	140.16	159.87	87.65	96.94	162.66	201.93
	NE [®]	128.70	136.18	135.61**	122.74	124.27	124.01*
P	FFP	109.00	102.35	83.37	45.26	53.02	182.27
	NE [®]	39.28	38.81	40.67	41.60	40.25	40.97*
K	FFP	59.41	42.17	66.27	31.80	38.60	86.35
	NE [®]	63.58	51.52	55.44	49.71	86.34**	59.14*

* Highest reduction; ** Highest increase

Comparison of maize yield across different farm types



Conclusions

- The farm typology- based nutrient recommendations in this study, demonstrated a significant increase in agronomic and economic benefit over current farmer fertilizer practices.
- This approach proved to be an excellent means for large-scale dissemination of Nutrient Expert based 4R fertilizer recommendations.
- We see an opportunity to project farm typology concept as a missing link in the current knowledge dissemination process.



IPNI

INTERNATIONAL
PLANT NUTRITION
INSTITUTE

Acknowledgement

E-mail: tsatya@ipni.net
sdutta@ipni.net



Thank you for your kind attention