

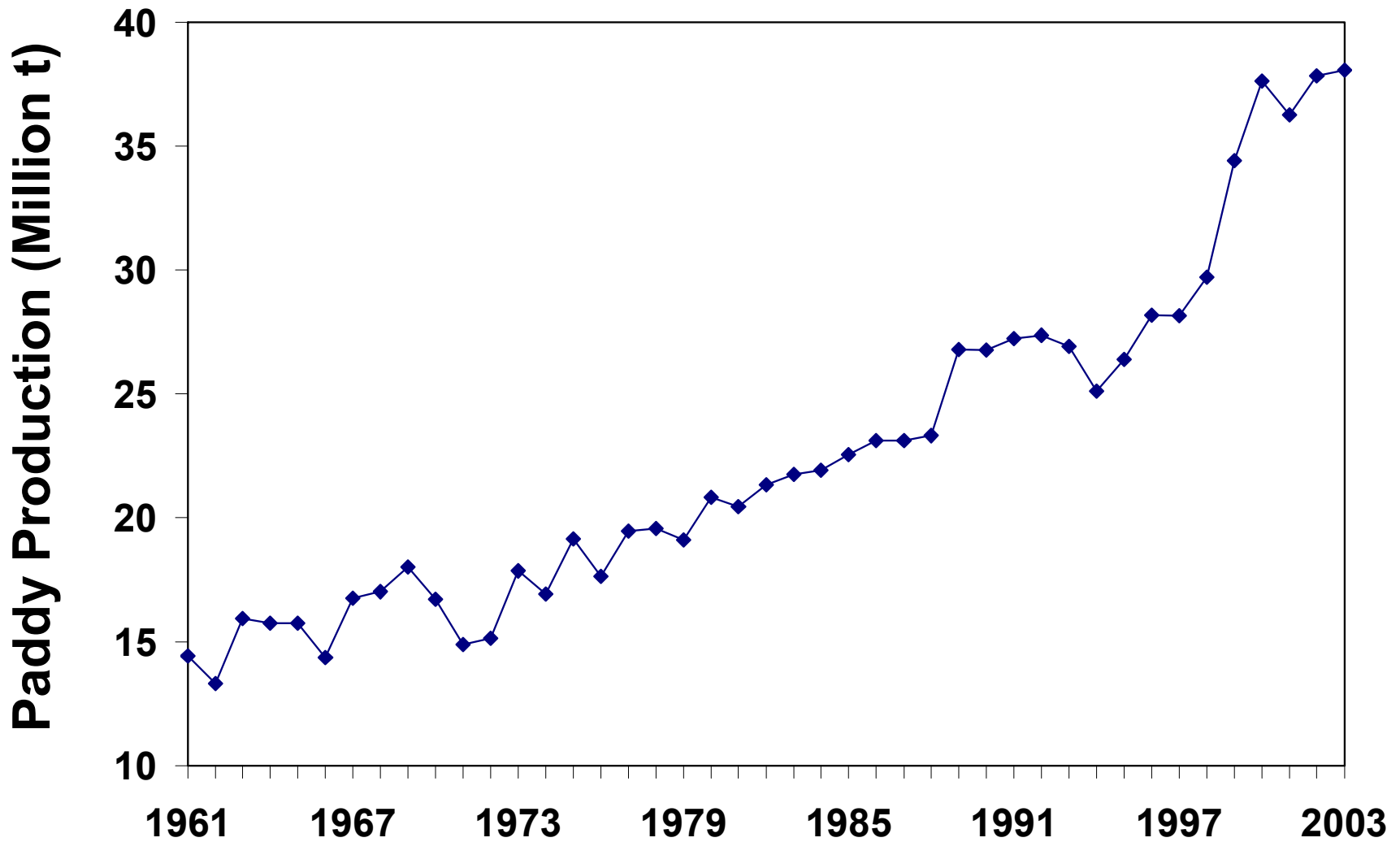
Urea Deep Placement as an Option for Increasing Nitrogen Use Efficiency

Walter Bowen

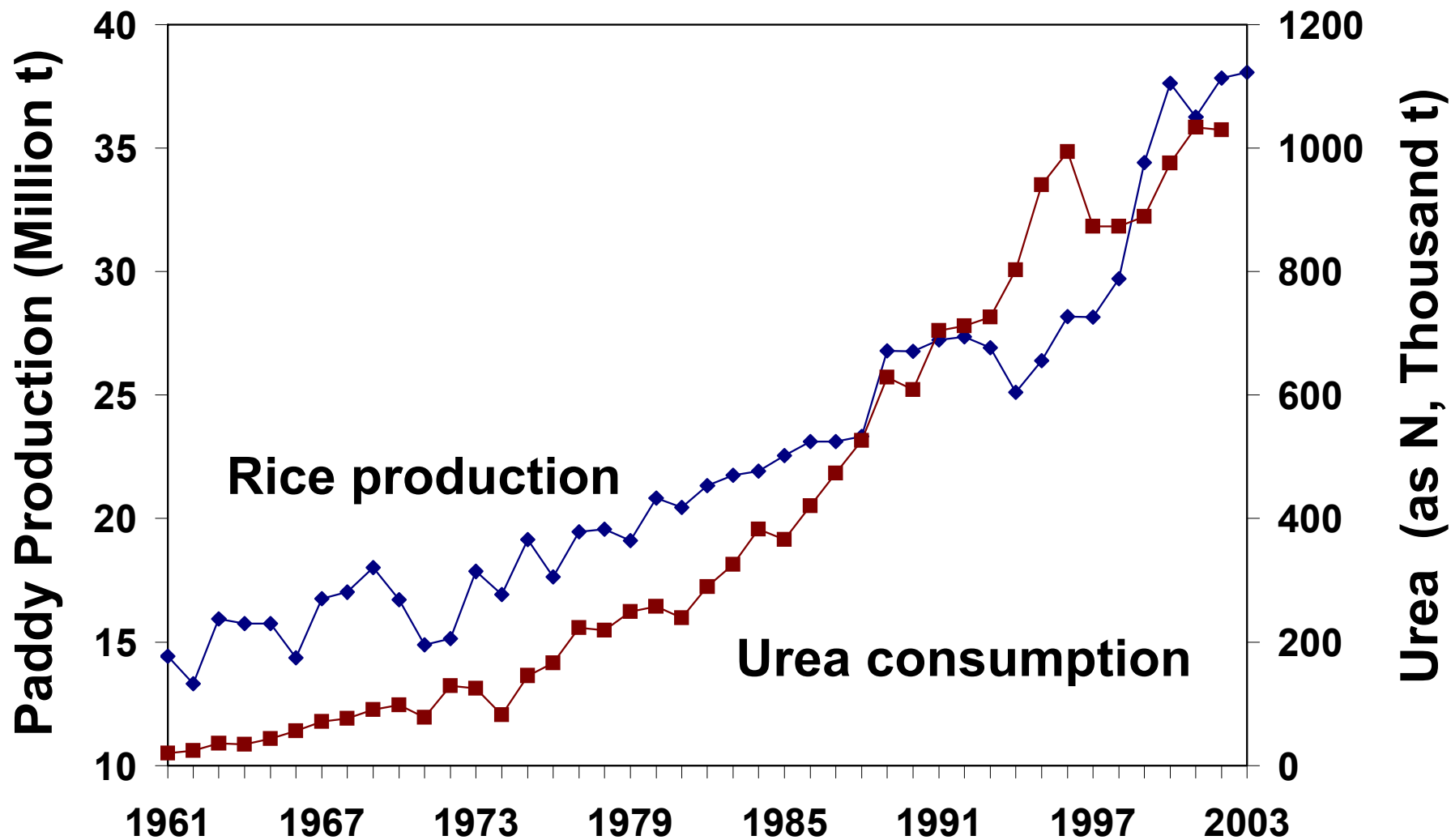
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** Prepared for the Rice-Wheat Consortium Meeting
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6-8 February 2005*

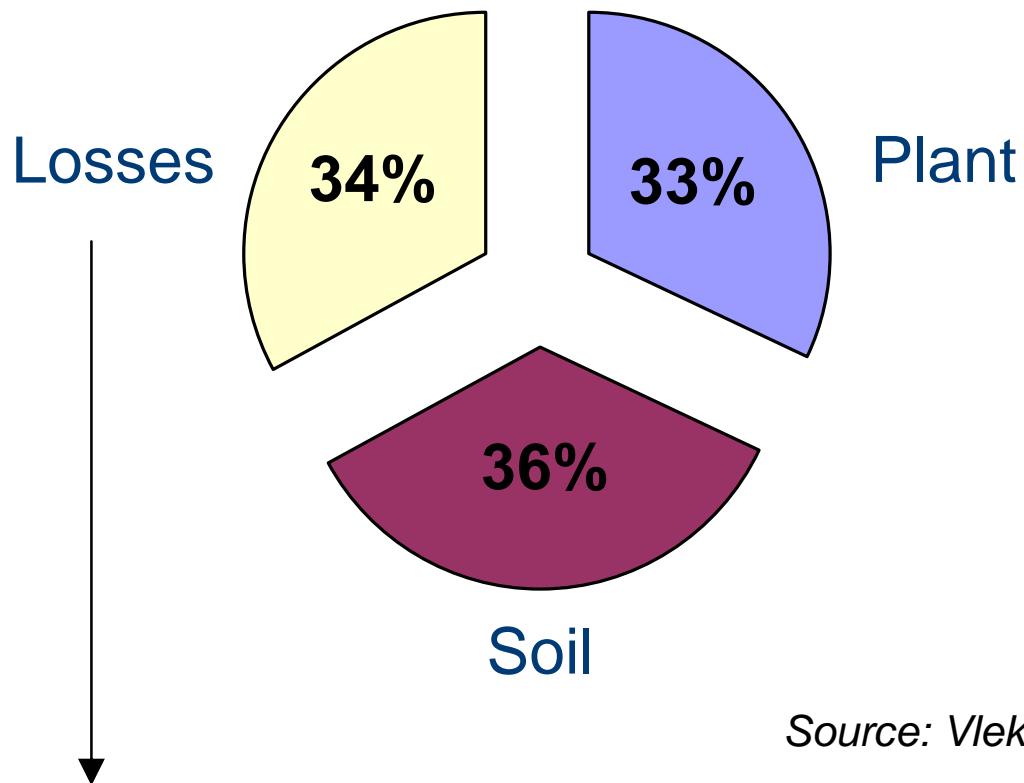
Rice Production in Bangladesh (million t)



Rice production and urea consumption in Bangladesh



Nitrogen balance for broadcast urea (rice)



Source: Vlek & Byrnes, 1986

- Negative economic impact
- Negative environmental impact

Rice yield response to urea application method (Philippines, IRRI/IFDC)

Treatment	Dry season yield (t/ha)	Wet season yield (t/ha)
Control	4.1	3.1
Split urea (2/3+1/3)	5.7	4.0
Urea Supergranule	6.2	5.1

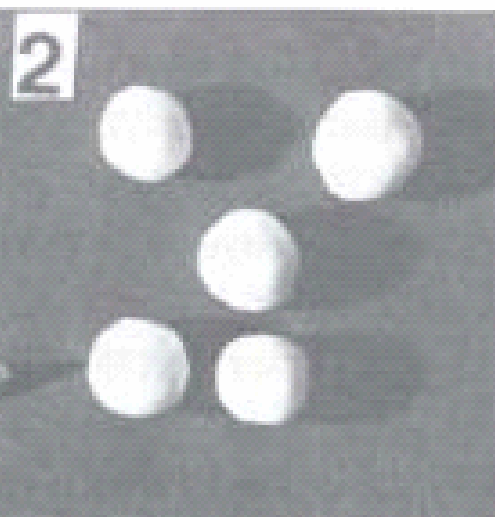
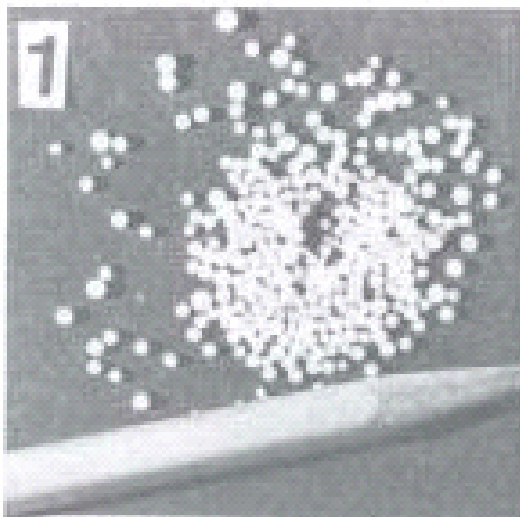
Dry season: 87 kg N/ha

Wet season: 54 kg N/ha

Source: Craswell et al. 1981

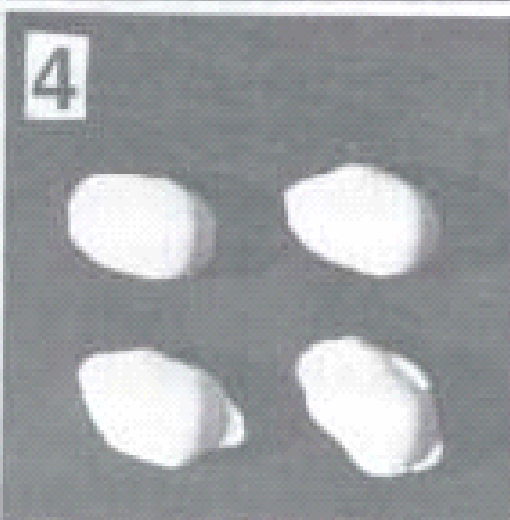
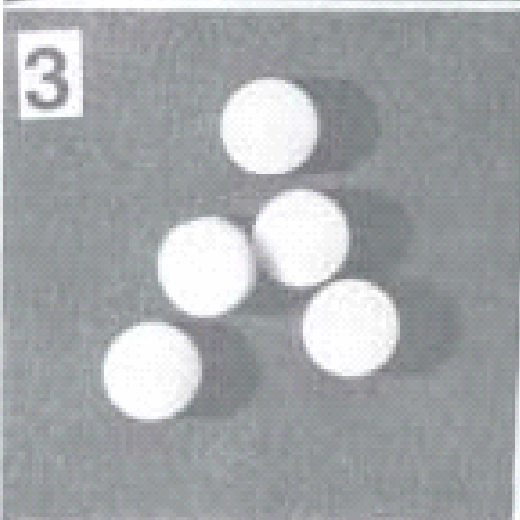
The Urea Super Granule (USG) product...

**Prilled
Urea**



**Urea
Super
Granule
(spherical)**

**Urea
Super
Granule
(tablet)**

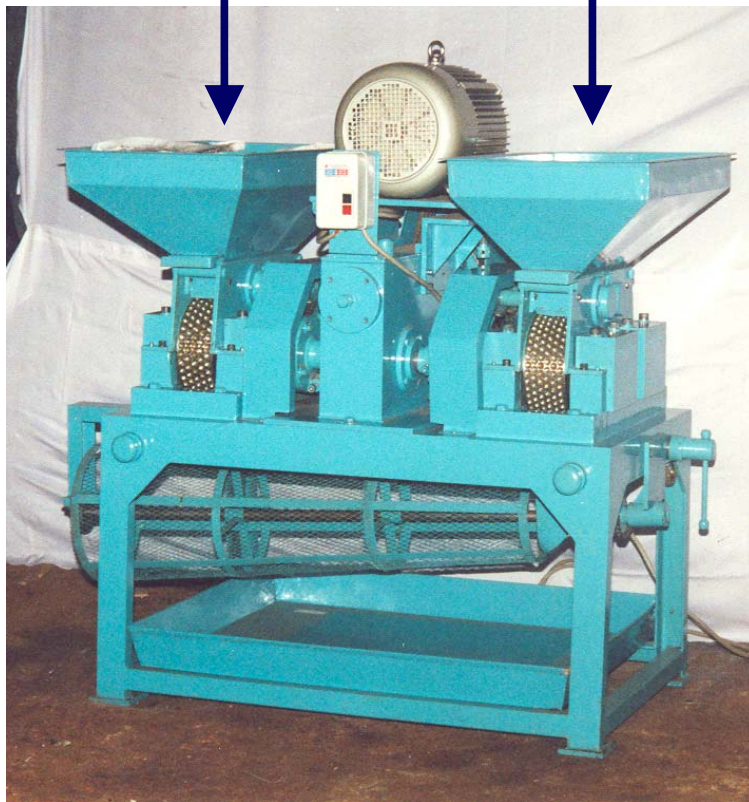


**Urea
Super
Granule
(briquette)**

Its production in the village...



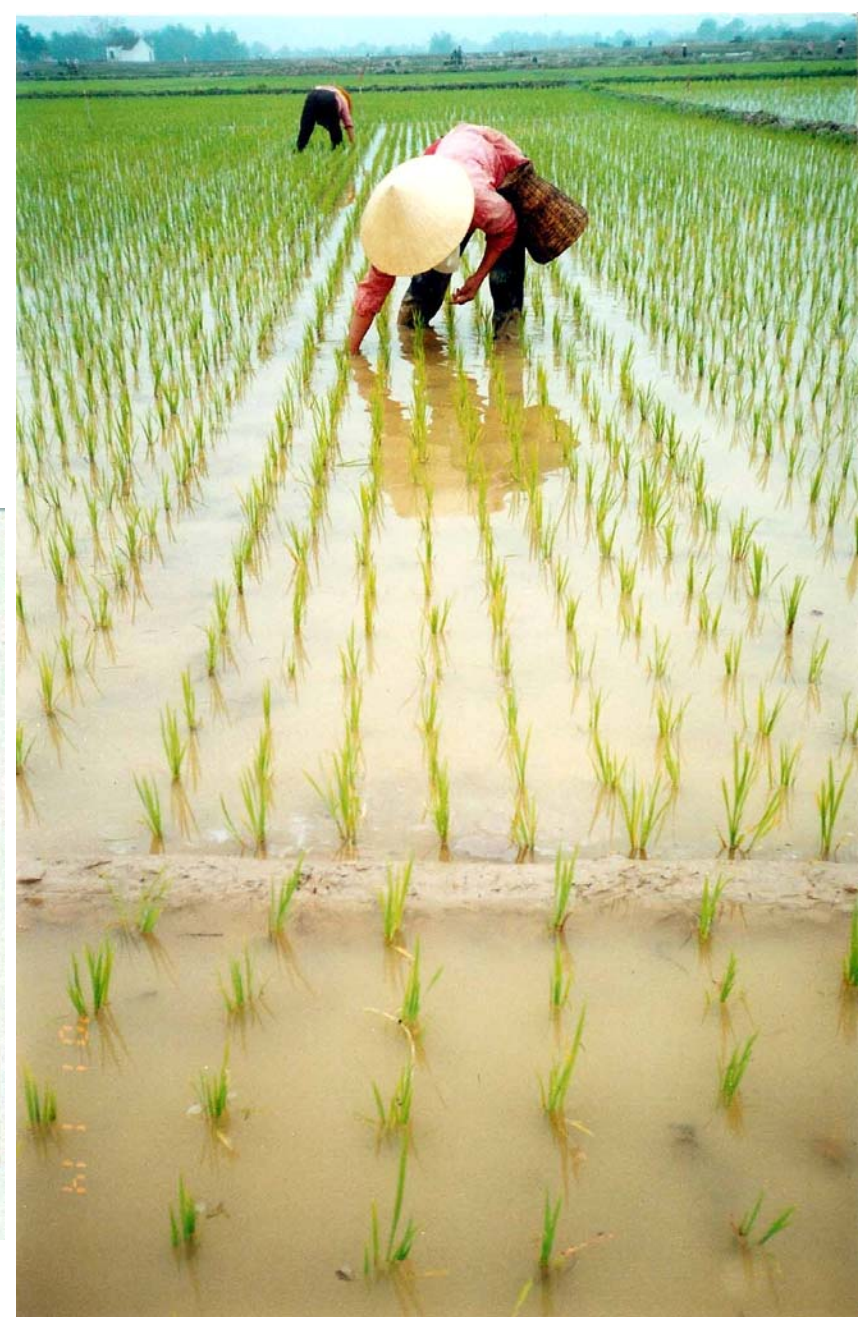
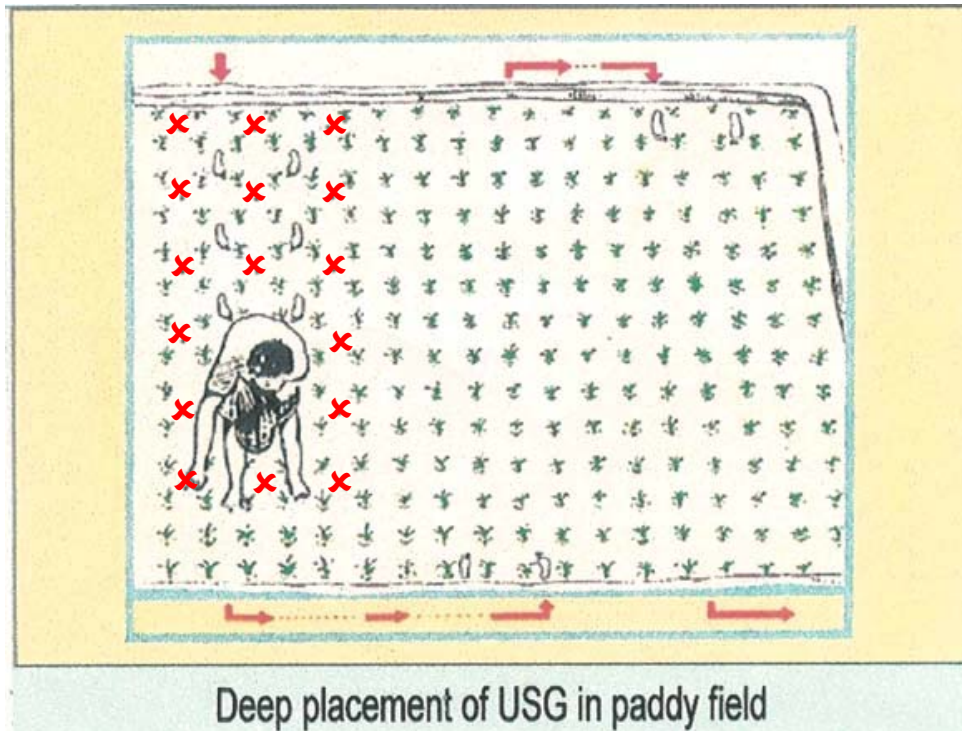
Prilled or granular urea



Briquettes bagged and sold to farmers near the village

Its application in the field...

- 7-10 cm depth
- Within one week of transplanting



On-farm comparisons of UDP and Farmers' Practice (FP) - Methods

- Two rice seasons: Boro (Jan, Feb – May, June)
 Aman (July, Aug – Nov, Dec)
- During 2000-2004, yield data were collected from 531 on-farm trials in 7 districts (N input data from 304 trials).
- Side-by-side plots were managed equally except for urea, and all farmers used high-yielding varieties.
- Grain weights and moisture content were determined by taking yield cuts from two subplots of 11.2 m² within each UDP and FP plot. Grain yields are reported as paddy (unmilled) rice at 14% moisture.

Parameters calculated for each on-farm comparison of UDP and FP

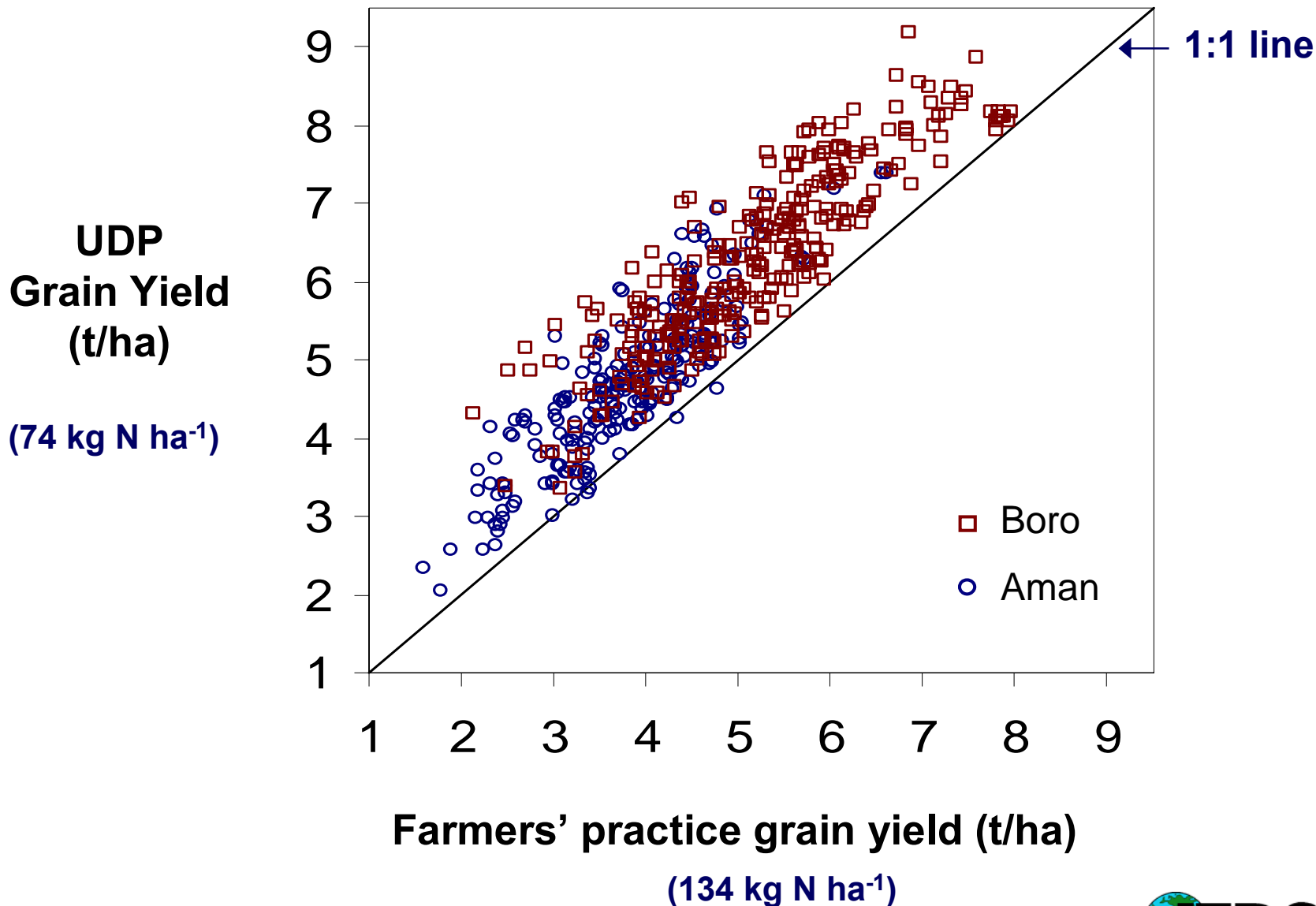
Δ Grain yield = UDP grain yield – FP grain yield
= **t ha⁻¹** or **kg ha⁻¹**

Δ Applied N = UDP applied N – FP applied N
= **kg N ha⁻¹**

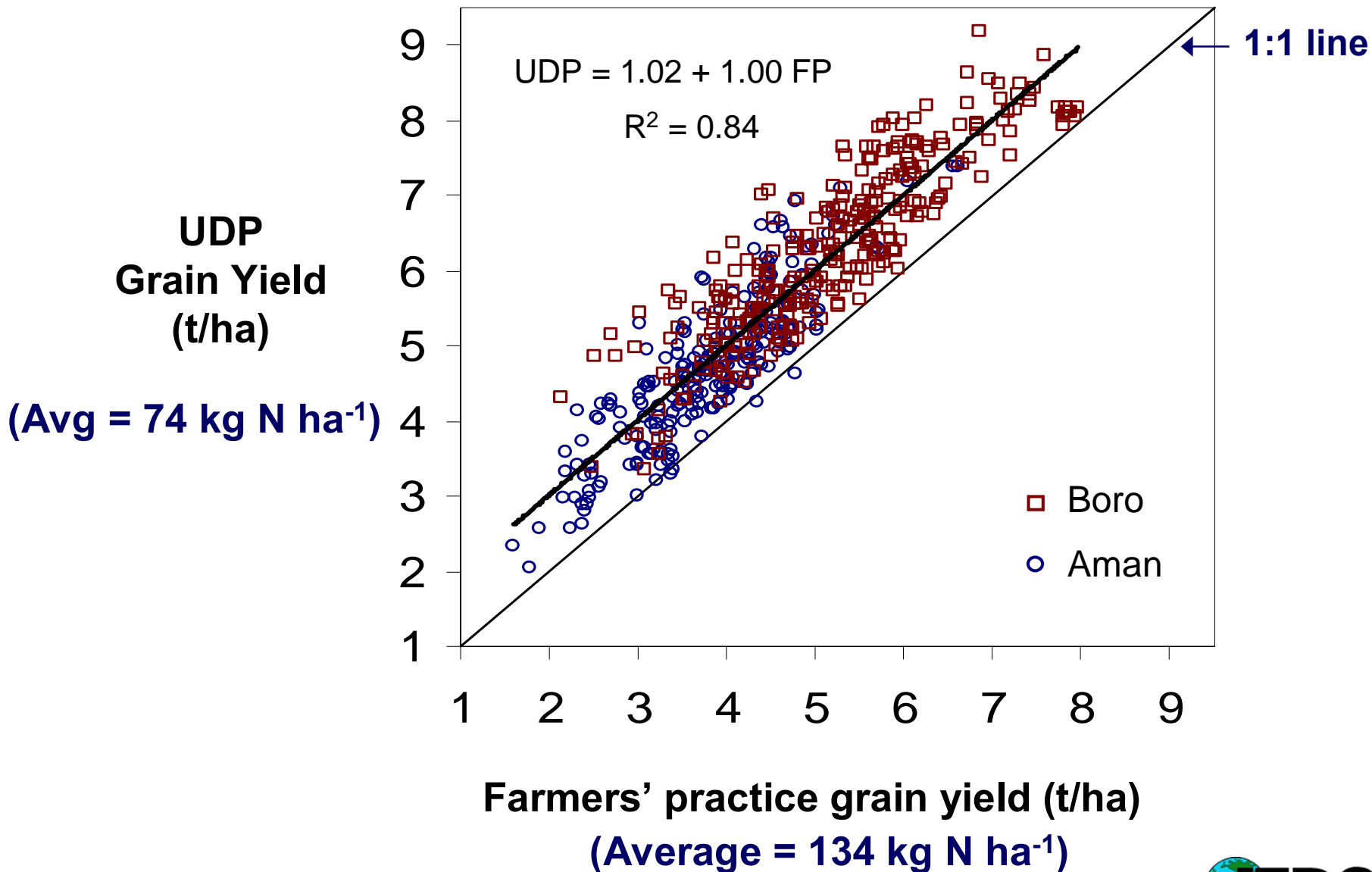
Δ PFP-N = PFP-N for UDP – PFP-N for FP
= **kg grain per kg N applied**

Δ Profit = UDP profit – FP profit
= **US\$ ha⁻¹**

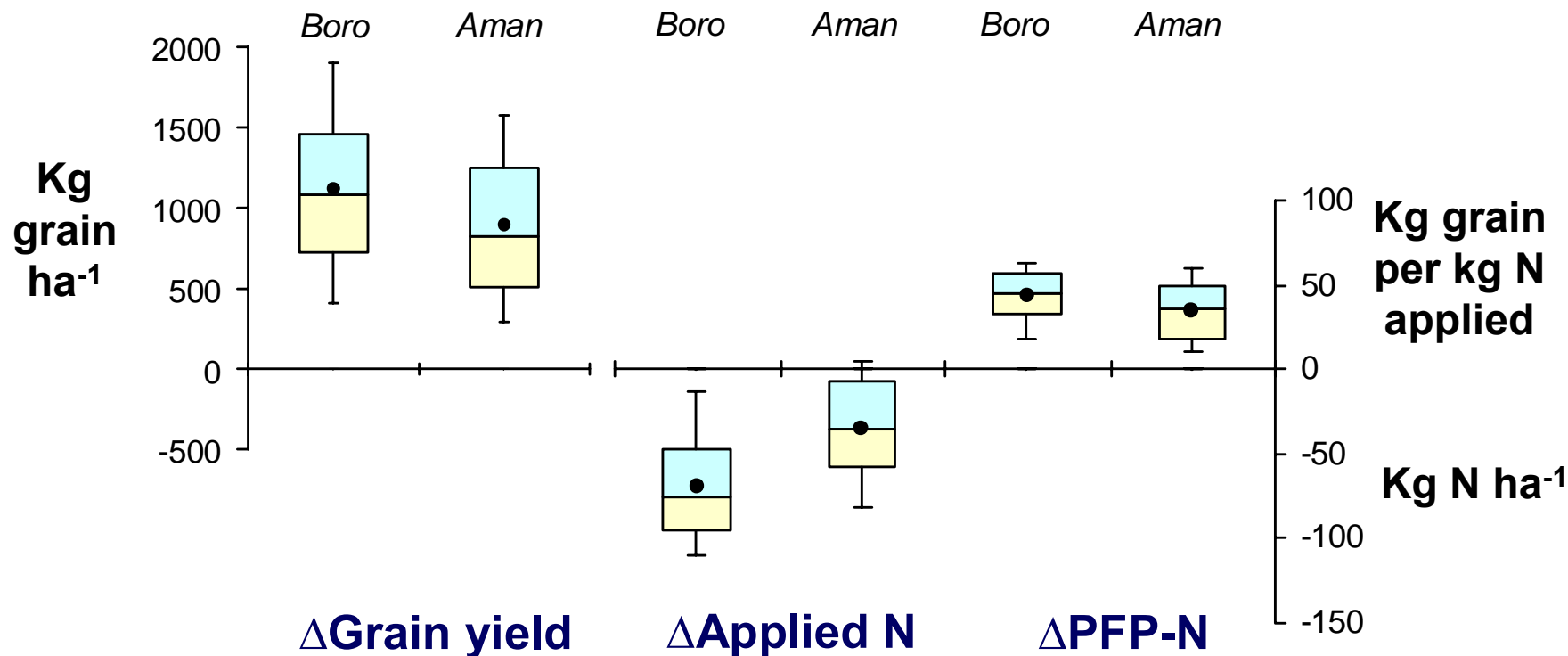
Side-by-side comparisons, Bangladesh, 2000-2004



Side-by-side comparisons, Bangladesh, 2000-2004

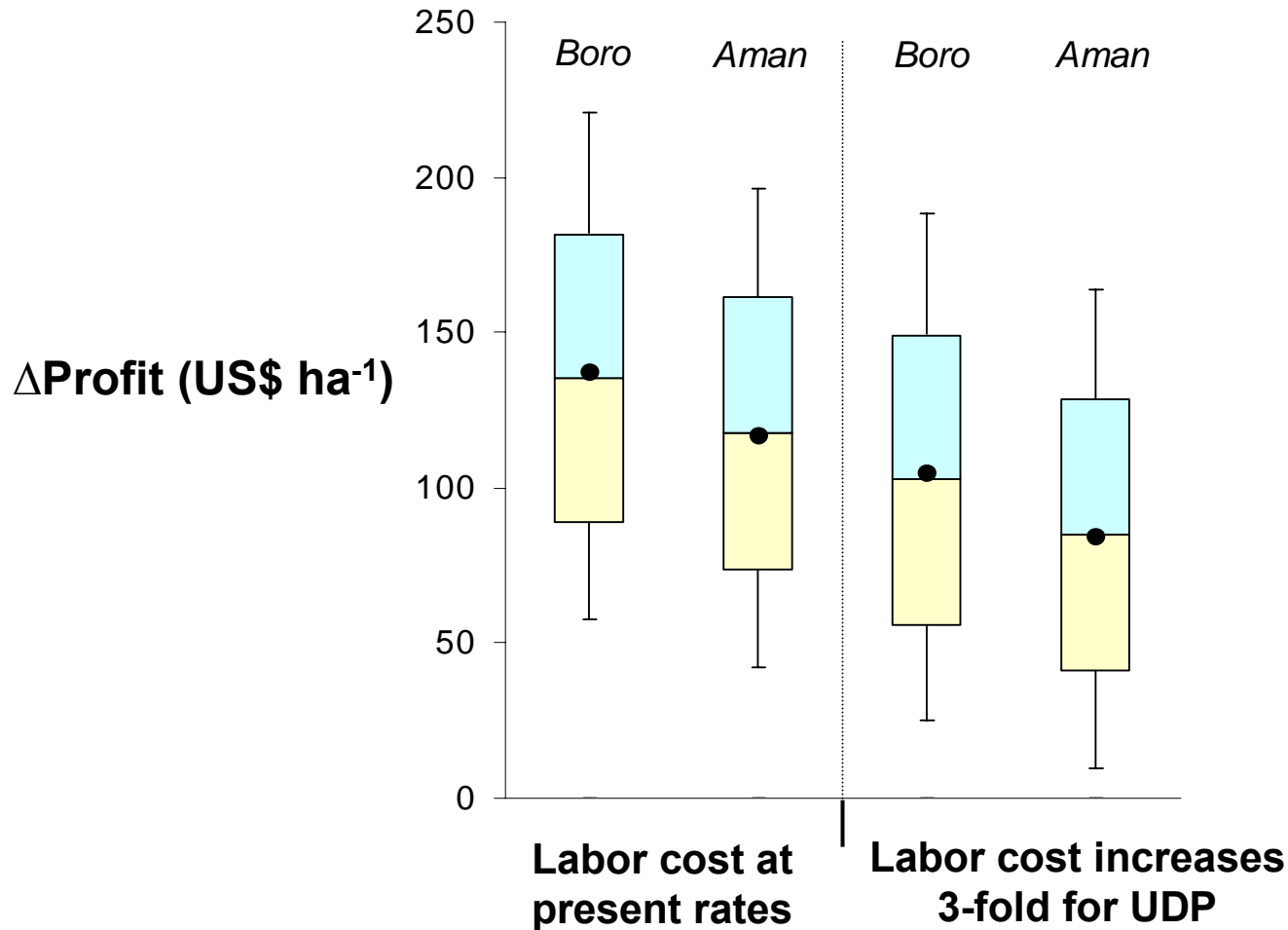


UDP versus Farmers' Practice: Changes in grain yield, N fertilizer applied, and partial factor productivity of applied N (Bangladesh, 2000-2004)



* Box plots display the 10th, 25th, 50th, 75th, and 90th percentile observations (means shown as solid markers)

UDP versus Farmers' Practice: Changes in profit (Bangladesh, 2000-2004)



* Box plots display the 10th, 25th, 50th, 75th, and 90th percentile observations (means shown as solid markers)

Issues for Discussion

- **Are more options for briquette size needed**
- **Will reliable applicators increase adoption**
- **Side by side comparisons of LCC and UDP**
- **How best to manage urea for DSR**
- **How best to manage urea for minimum and no-till systems**
- **UDP for other crops and aquaculture**