



Enhancing Productivity and Farmer Profitability in Broad-Acre Crops with Controlled-Release Fertilizers

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Global Need for Better Nitrogen Management

- The world needs increased productivity
- Increased farmer profitability in the face of increasing costs
- Decrease impact of nutrients in the environment
- Pressure to reduce nutrient use

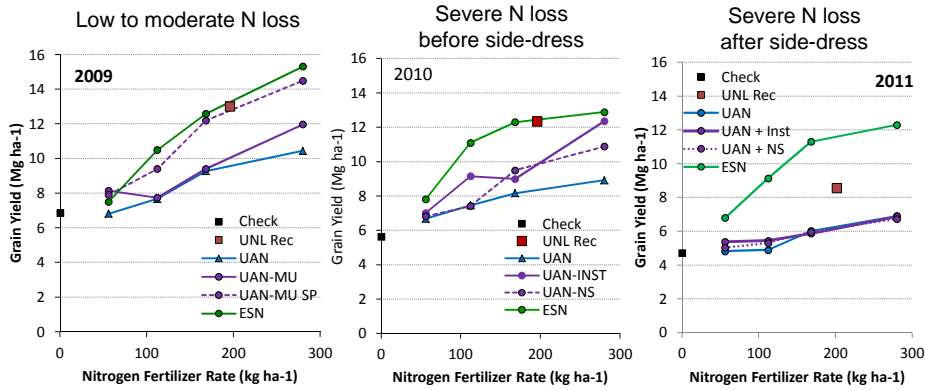


Controlled-release fertilizers can

- Increase crop yields
- Improve grower profitability
- Reduces losses to the environment
- Make N management easier



ESN Saves Applications and Protects Your N Investment



ESN maintains consistent N performance under conditions where conventional fertilizers fail. ESN produces yields similar to or greater than recommended best management practices with less N and fewer applications.

Nebraska Sprinkler Irrigated Corn on Sandy Soils
Source: Dr. R Ferguson, Univ of Nebraska

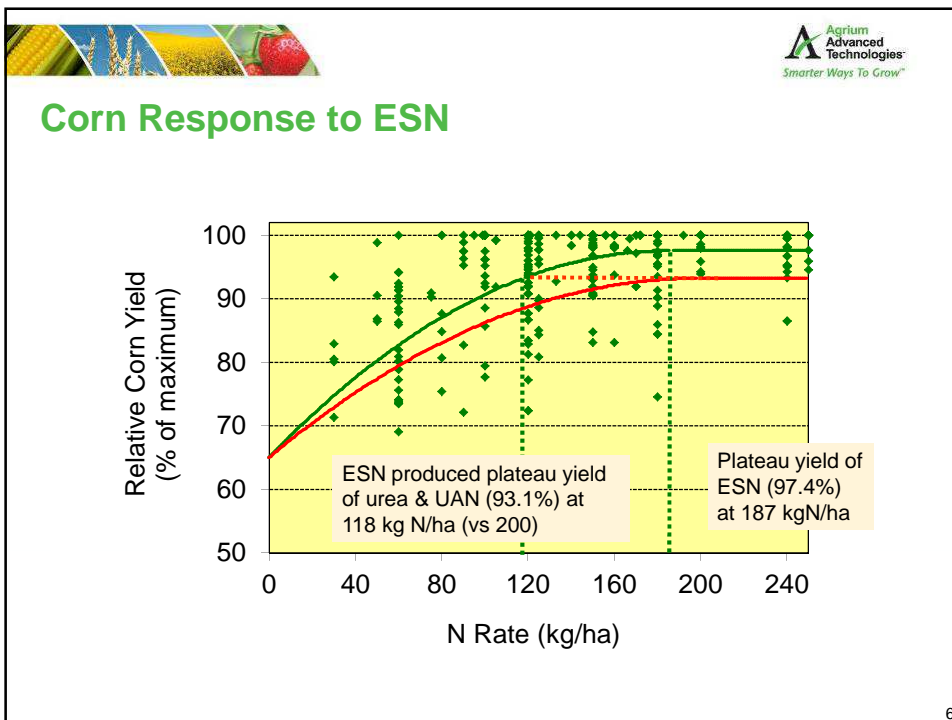
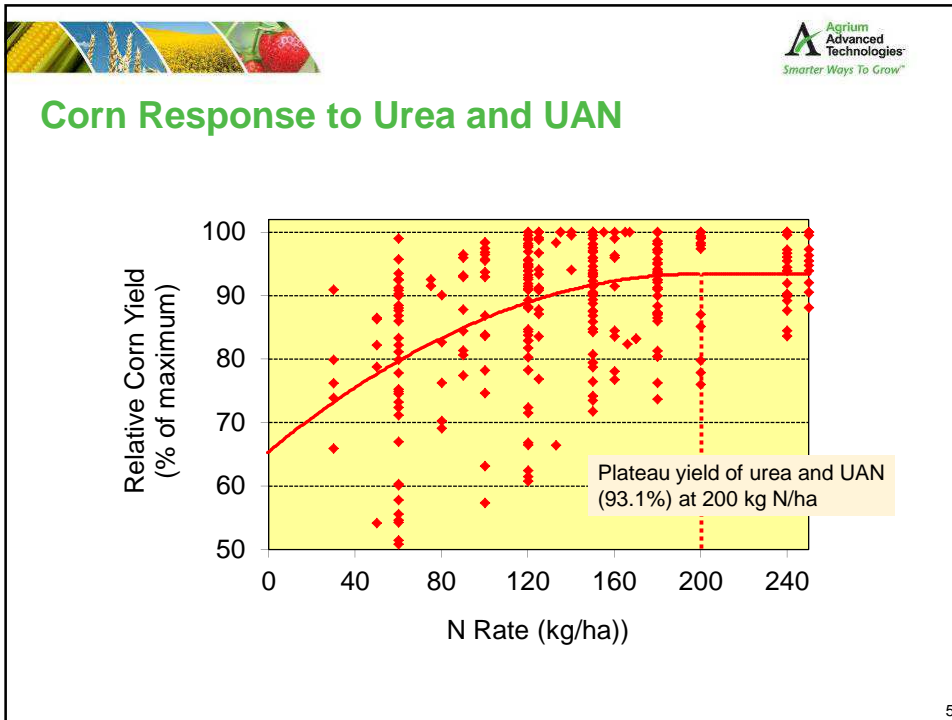
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ESN Value From Compilation of Research Data

- Over 500 site-years of research in No. America since 2000
- University and government scientists
- Crop yield response over many environments and soils
- Analysis of combined data to determine:
 - CRU value to the grower
 - High value environments and soils

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ESN Benefit and N Loss Factors

	Greater Precipitation Or Irrigated		Lower Precipitation	
	Lower Organic Matter	Higher Organic Matter	Lower Organic Matter	Higher Organic Matter
Poorly Drained				
Moderately Well Drained				
Well Drained				

The darker the green box, the greater the benefit of CRU

- Greater precipitation is >150-200 mm of rainfall in two months after application
- Higher organic matter represents > 30-40 g/kg

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ESN Value Proposition for Corn: Typical Yield Increase

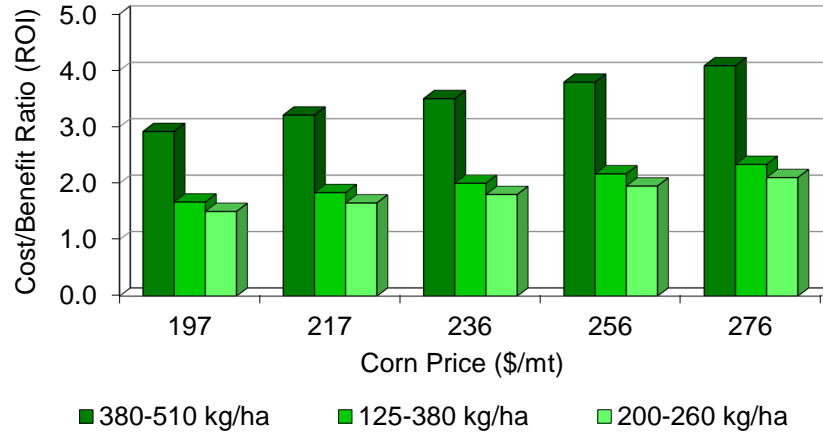
	Greater Precipitation Or Irrigated		Lower Precipitation	
	Lower Organic Matter	Higher Organic Matter	Lower Organic Matter	Higher Organic Matter
Poorly Drained	380-510 kg/ha	200-260 kg/ha	0-125 kg/ha	0-125 kg/ha
Moderately Well Drained	380-510 kg/ha	200-260 kg/ha	0-125 kg/ha	0-125 kg/ha
Well Drained	380-510 kg/ha	200-260 kg/ha	125-380 kg/ha	0-125 kg/ha

- Expectations are based on >80% of N coming in the form of ESN
- Greater precipitation = 150-200 mm of combined rainfall in two months after application (the majority of the corn belt)
- Higher organic matter represents > 30-40 g/kg

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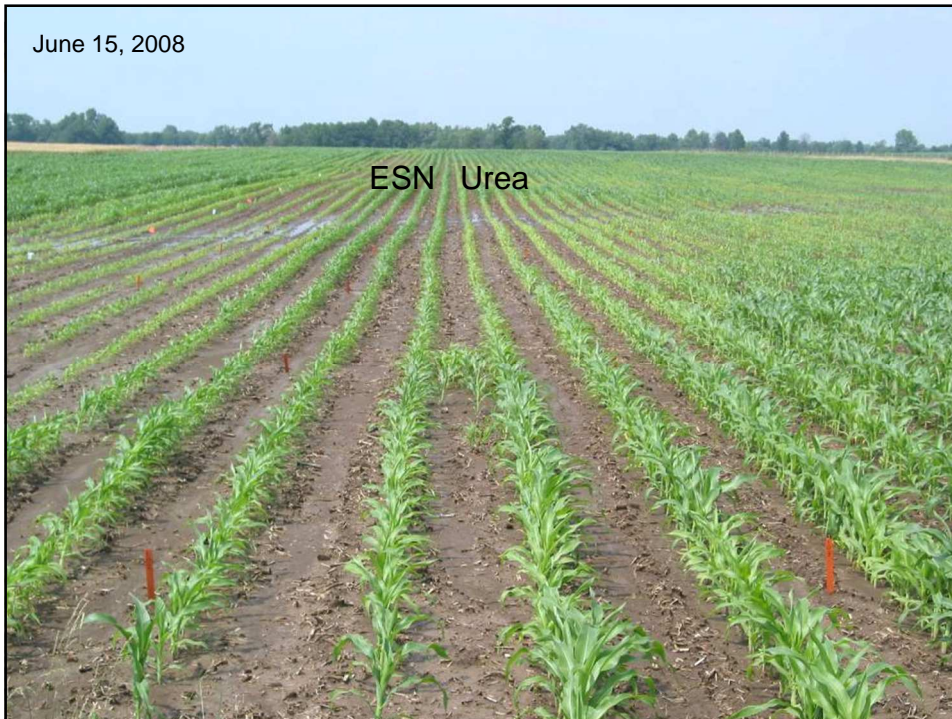
ESN Provides Greater Return on Your N Investment

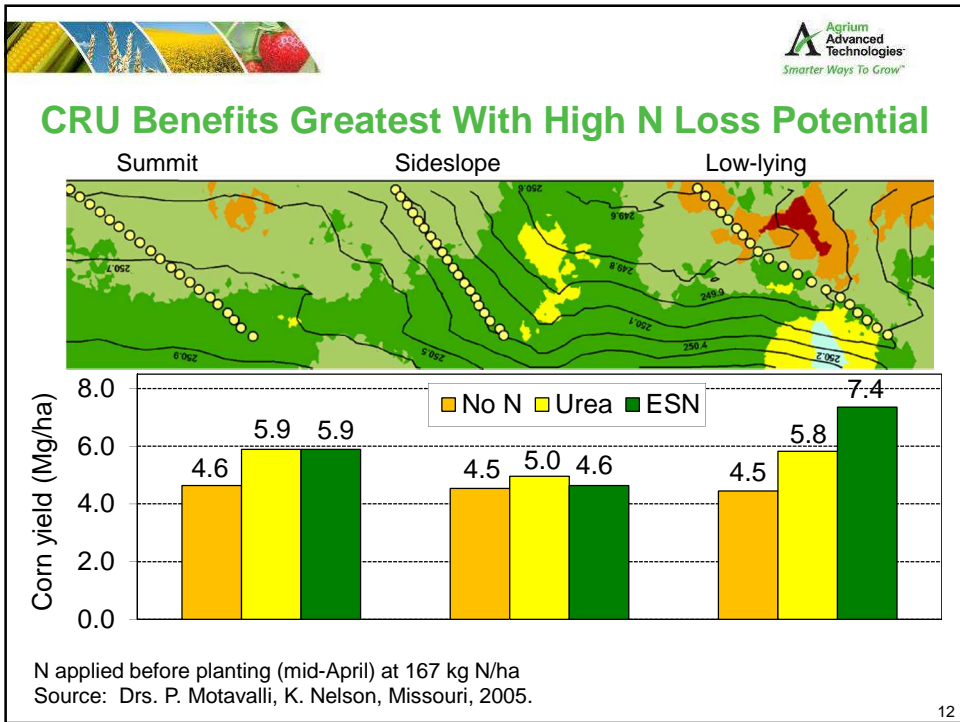
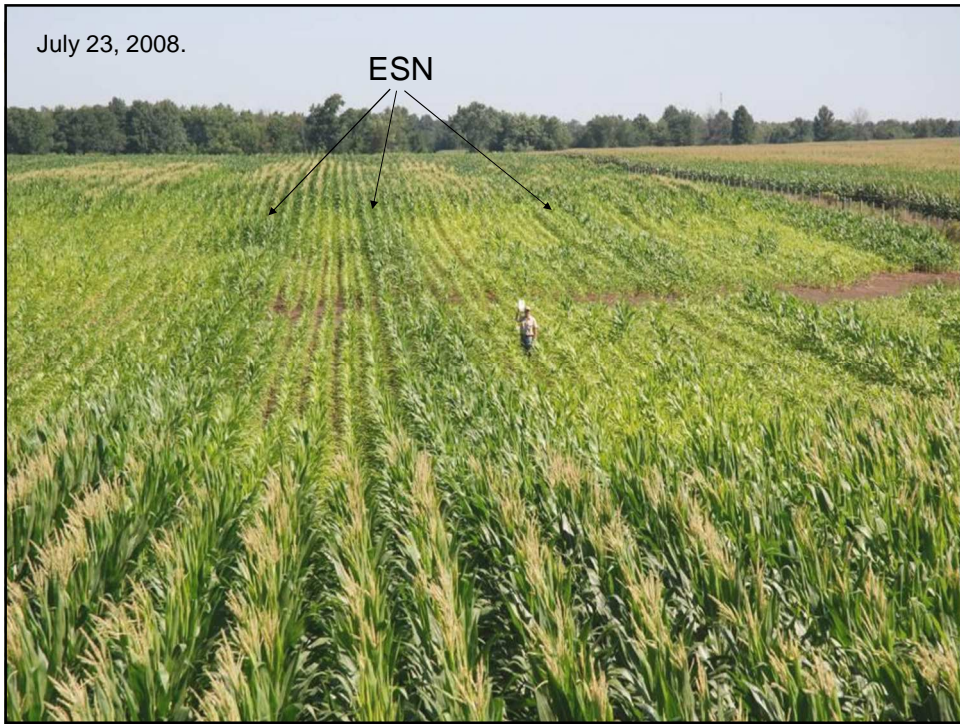


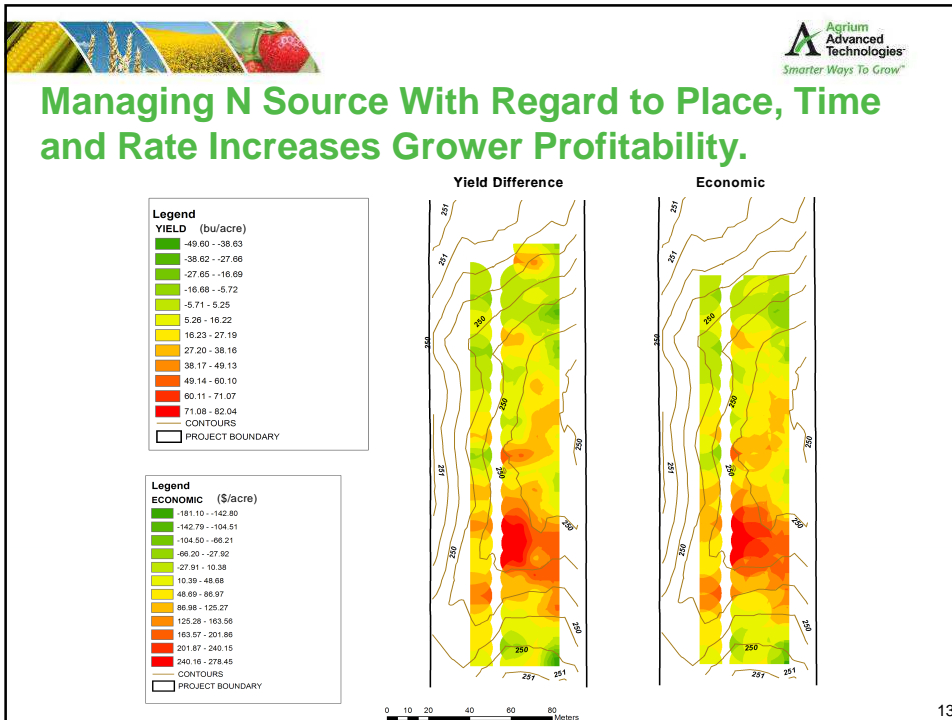
Calculation assumes an ESN premium of \$0.44 per kg of N over urea.

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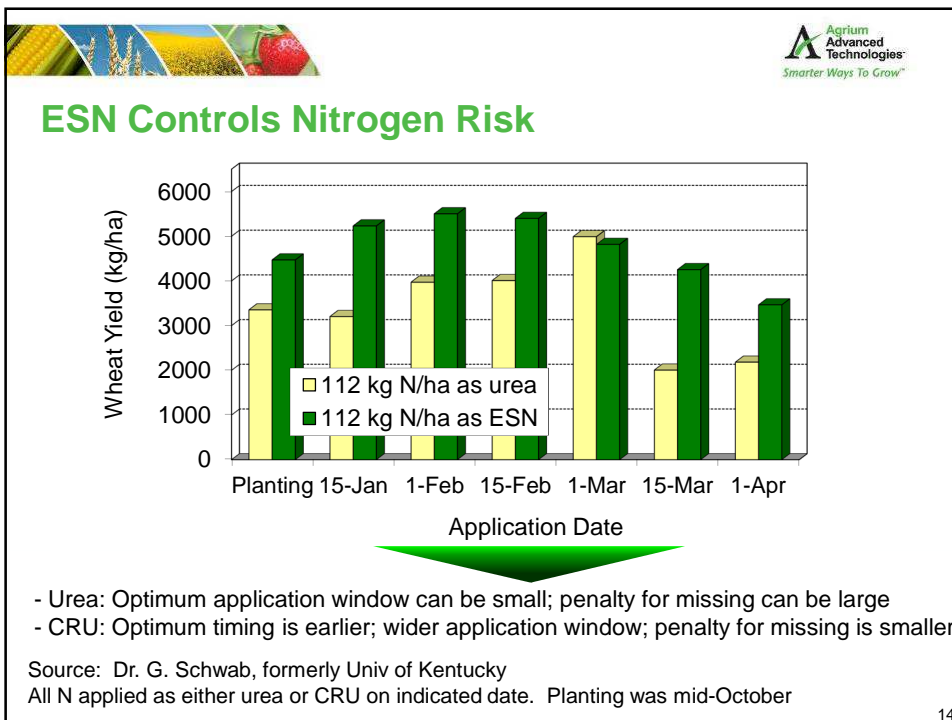
June 15, 2008







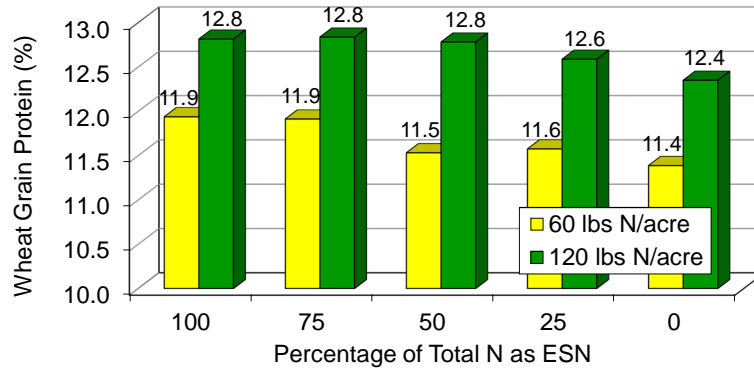
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ESN Increases Spring Wheat Protein

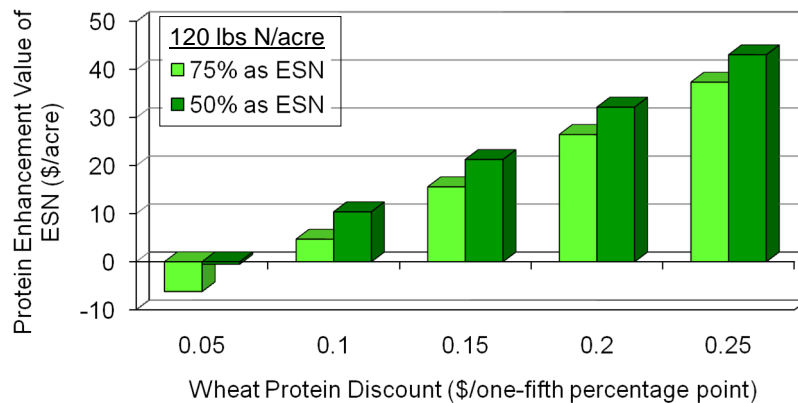


Data are means of four site years. All N applied at planting
Yield did not differ significantly among treatments. Average yield was 109 bu/acre.
Source: Dr. A Sims, Univ of Minnesota-NWROC, Crookston, MN, 2008-09

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ESN Increases Protein Value in Spring Wheat

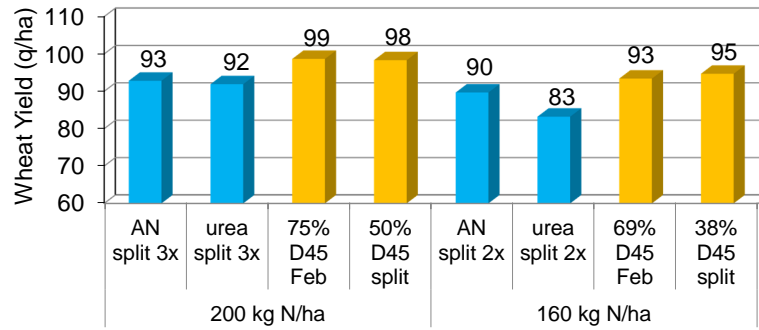


Values are calculated from average protein increases and average yield of 109 bu/acre from four site-years near Crookston, MN, 2008-09. N rate is 120 lbs of fertilizer N applied at planting.

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CRU Simplifies N Management for France Wheat



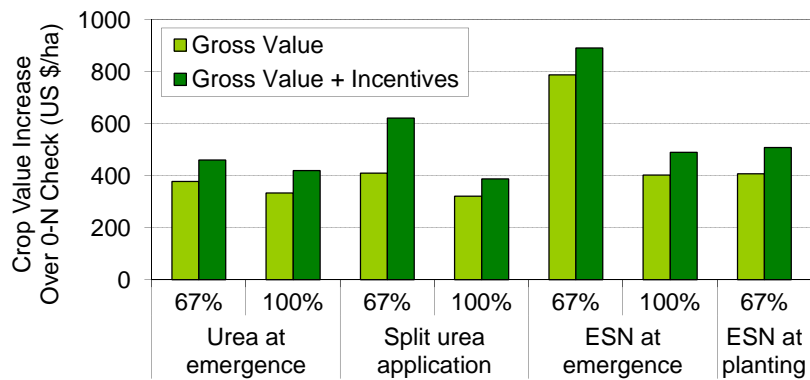
- Feb CRU treatments produced greater yields than conventional split applications
- D45 treatments produced the highest yields at each N rate.
- D45 at 160 kg N yielded at least as great as split AN or urea at 200 kg N/ha.

- Percentages shown are the percentage of total fertilizer N as D45.
 - D45 applied in Feb consisted of 50 kg N/ha as urea and the balance as D45.
 - D45 split treatments were 50 kg N/ha as urea in Feb plus urea and D45 applied in Mar
 - AN and urea split treatments were 200 kg N/ha in three applications or 160 kg N/ha in two applications

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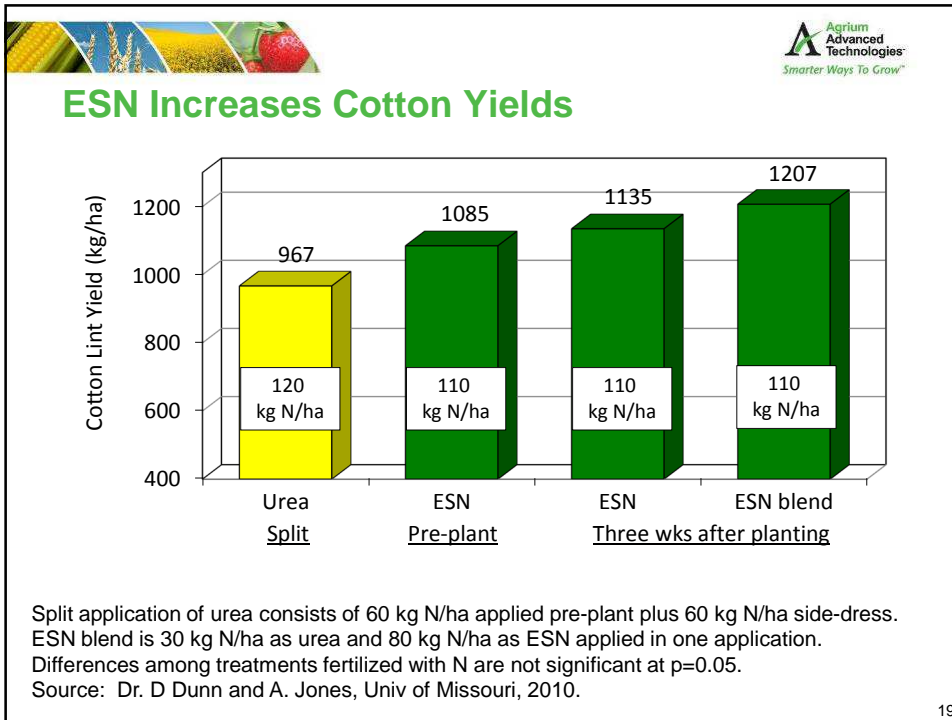


ESN Increases Potato Crop Value

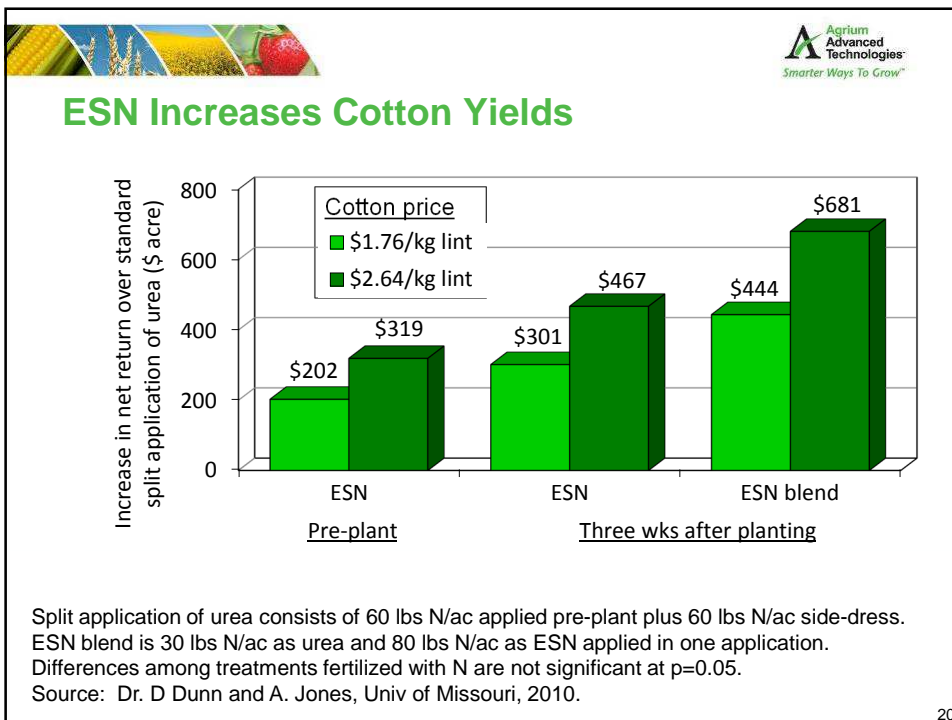


Average of five site years in So. Idaho, 2006-2007; Russet Burbank.
 X-axis is percentage of Univ. of Idaho recommended N rate.
 Crop value calculated from standard grower contract. Incentives are additional payments for size & quality.
 Source: Dr. B. Hopkins, Brigham Young Univ.

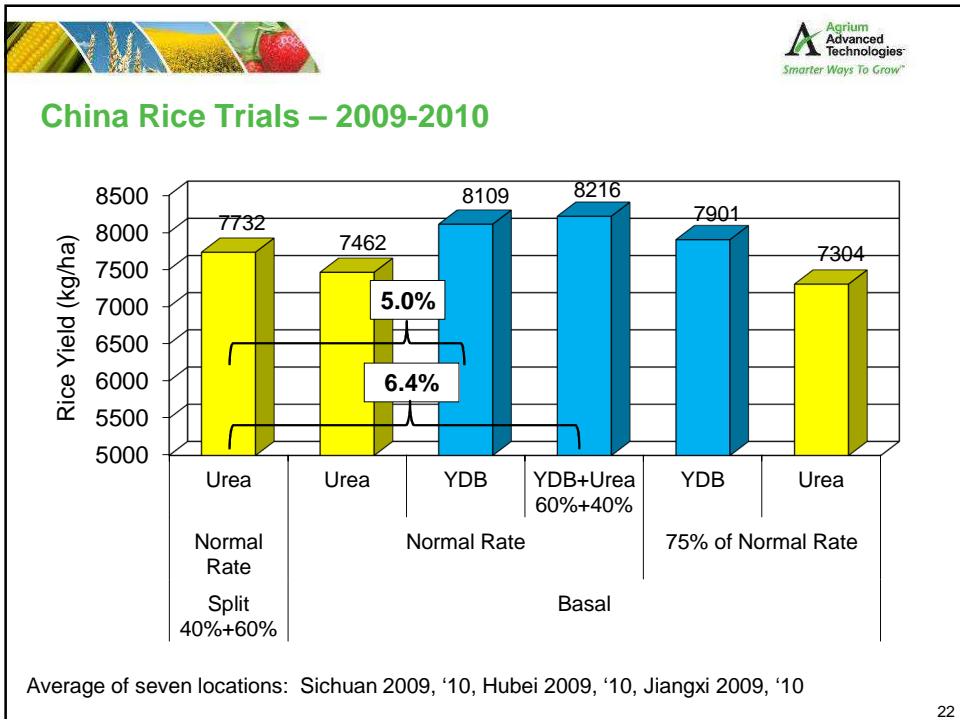
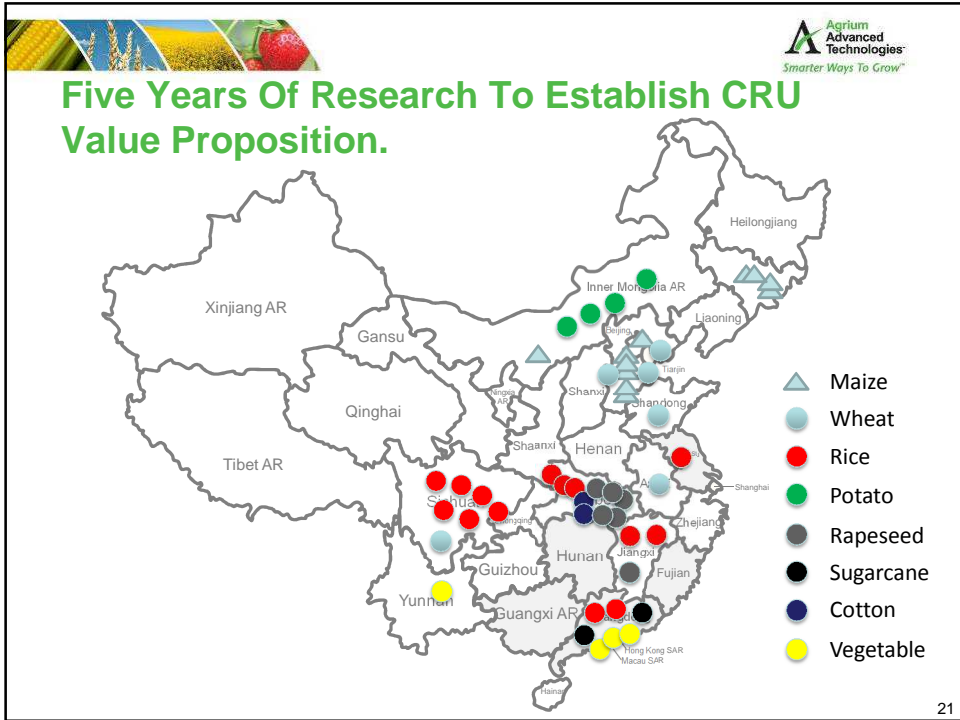
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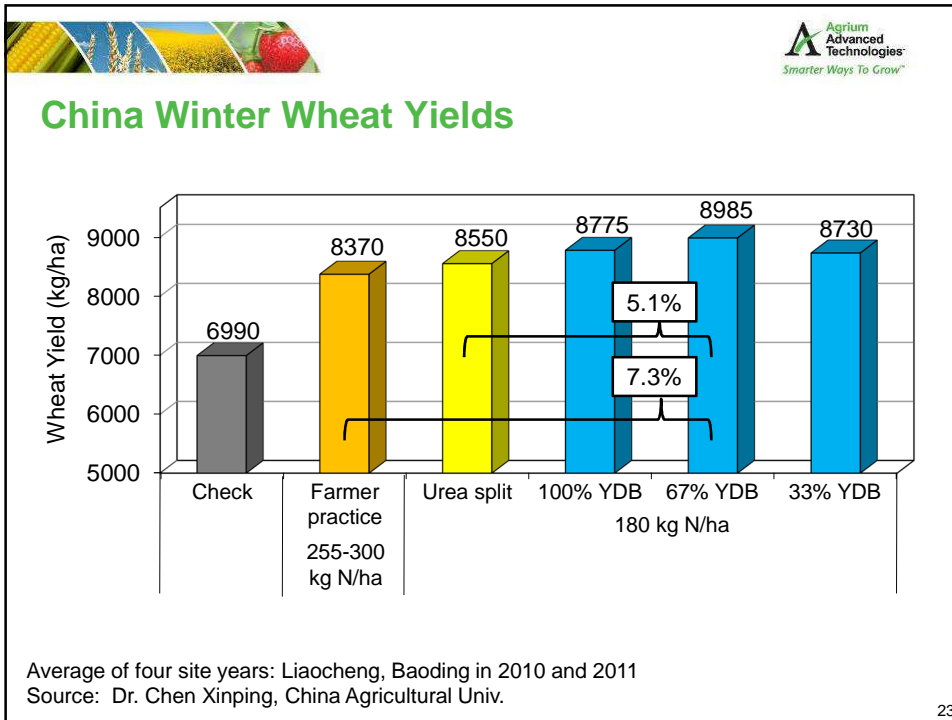


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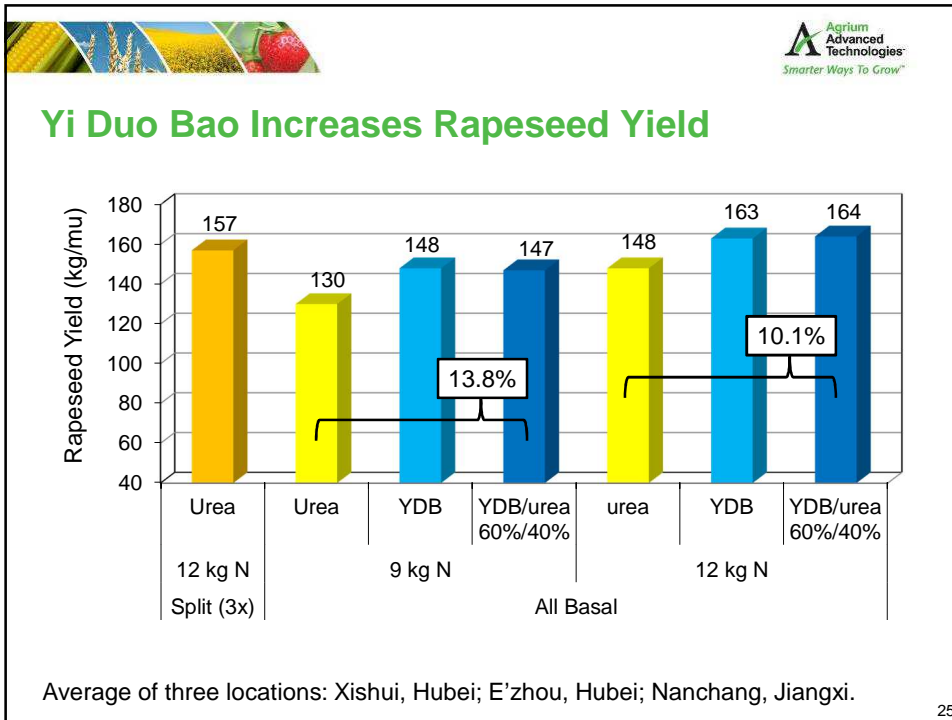
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Profitability of N Treatments on Winter Wheat

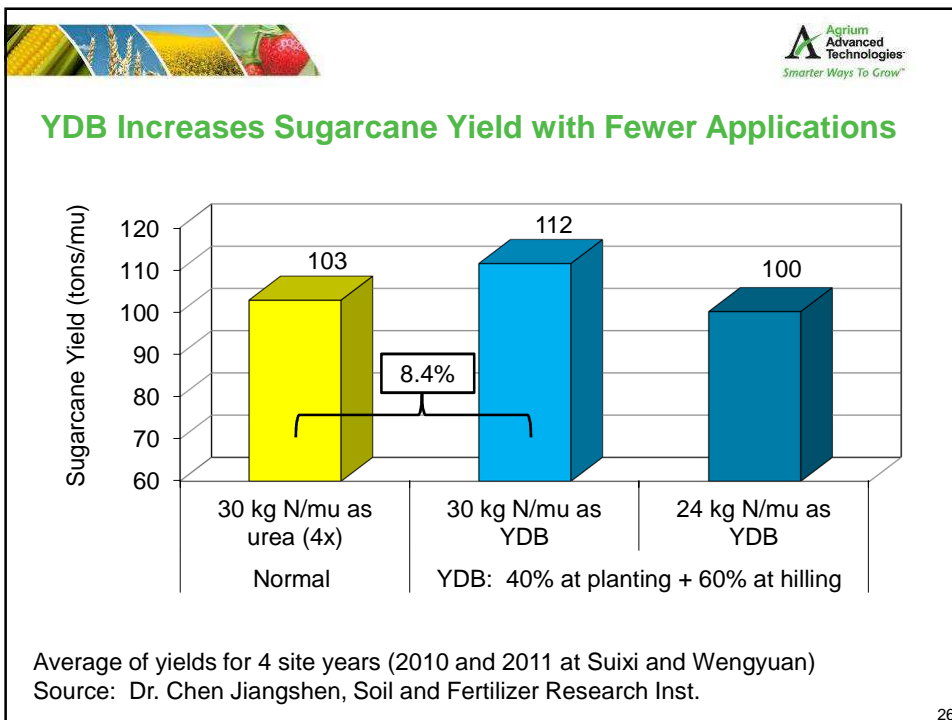
N Treatments	Profit Increase (yuan/ha)
	Average
CK1	-1620
Split urea 20 kg N/mu	0
Split urea 12 kg N/mu	780
Basal 100% YDB	1485
Basal 67% YDB blend	1905
Basal 33% YDB blend	1485

Note: Profits increase is profit difference between a treatment and conventional N management

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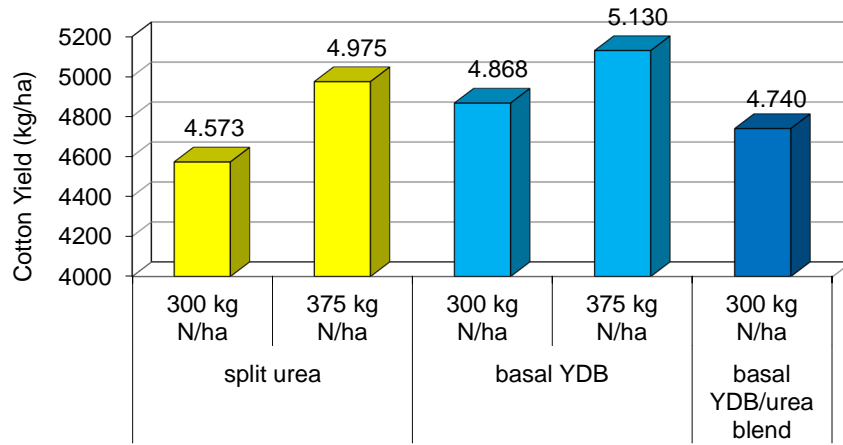
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Yi Duo Bao Increases Cotton Yields in Hubei

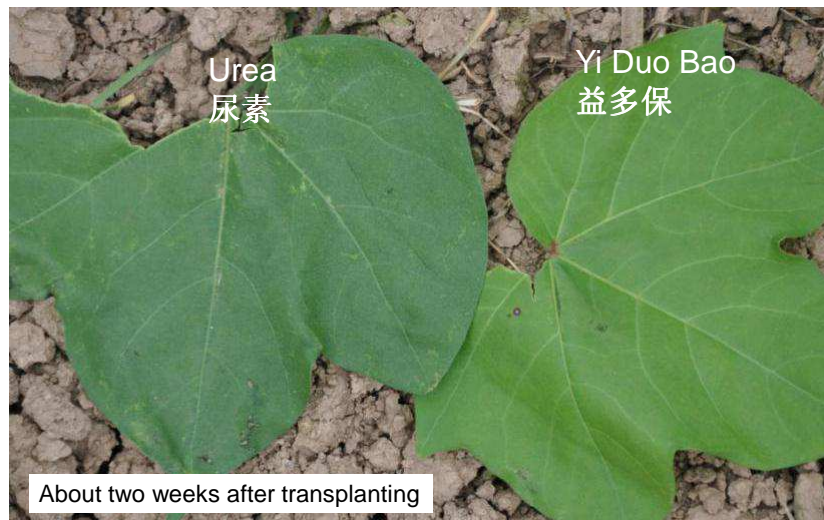


Urea split is 4 applications; YDB/urea blend is 60% of N from YDB and 40% from urea.
Average of two locations – Wuxue and Jingzhou, Hubei, 2011

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Cotton trial at Honghu, June 2010



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Maximizing the Value of CRFs

- Research and education
 - Understanding how and where different modes of action should be used
 - Understanding where and when benefits are observed
- Target right technologies to specific nutrient loss and uptake mechanisms with consideration of soil & weather conditions, cropping system, equipment, infrastructure, etc
- Integrate technologies to apply the right source at the right rate, time and place.

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Benefits of Controlled-Release Nitrogen

- Improved N-use efficiency → greater yields
- Greater profit for grower
- Single-application N management
- Reduced N losses → reduced environmental impact



Controlled-release fertilizers can be agronomically and economically viable for broad-acre agriculture and should be considered as a management option to improve nutrient-use efficiency and reduce environmental impact.

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