

**STARTER FERTILIZER
COMPOSITION AND
METHODS OF APPLICATION
FOR REDUCED TILLAGE
CORN**

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THIS PRESENTATION:

**EMPHASIS ON USE OF
FLUID STARTERS**

**IN HIGH RESIDUE SYSTEMS,
USE OF STARTER SHOULD
BE A MANAGEMENT
DECISION, UP FRONT,
REGARDLESS OF SOIL
TEST VALUES**

STARTERS

WHERE TO PUT THEM?





**MANY FACTORS INFLUENCE
CROP RESPONSES TO
STARTERS BESIDES SOIL
TEST VALUES**

Large amounts of residues

Cold soils

Compaction

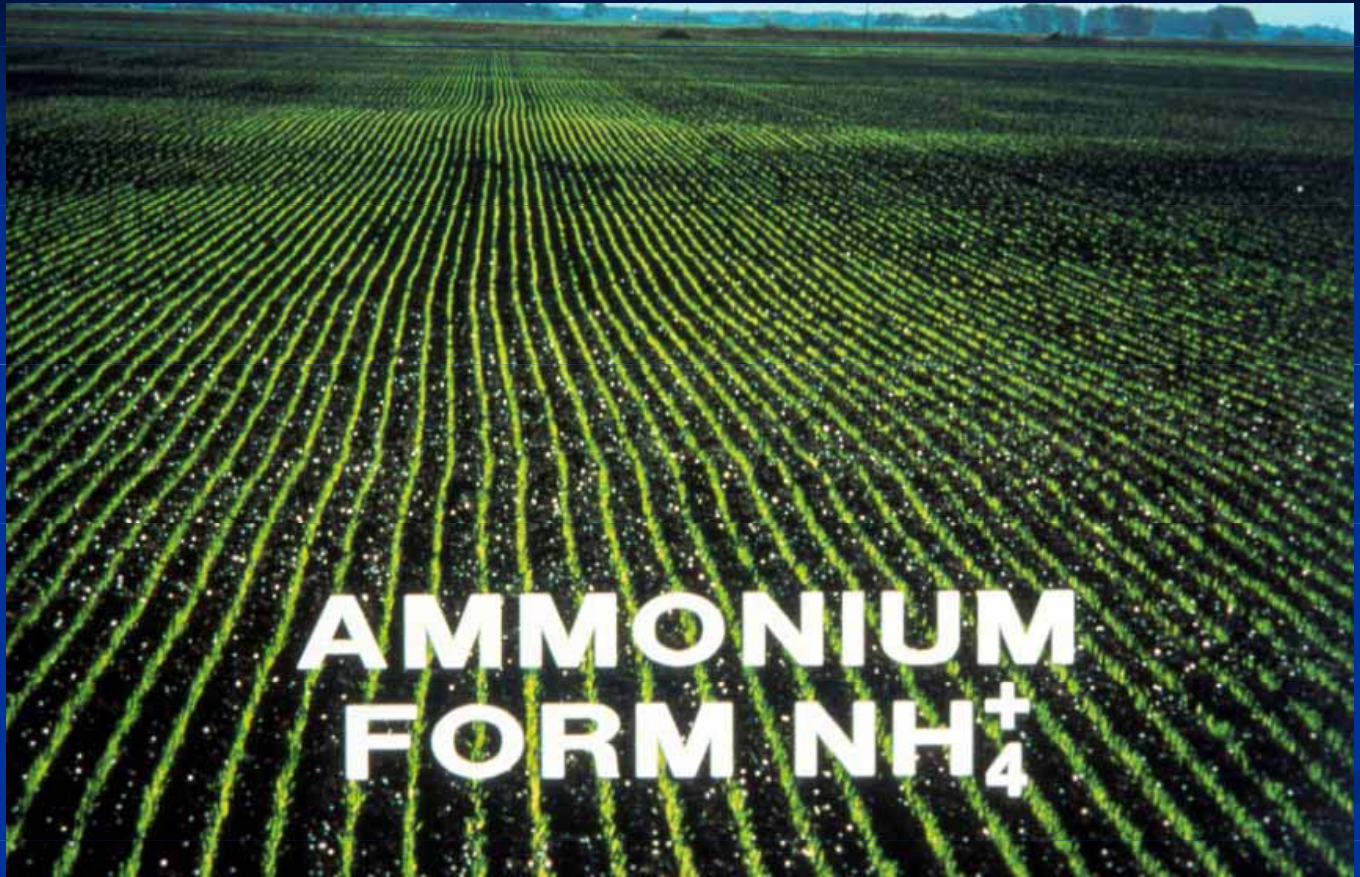
Genetics

**MICROENVIRONMENTAL
CONDITIONS HAVE
SUBSTANTIAL EFFECTS
ON NUTRIENT
AVAILABILITY**

MODIFICATION OF
MICROENVIRONMENTS
CAN ENHANCE
NUTRIENT USE
EFFICIENCY

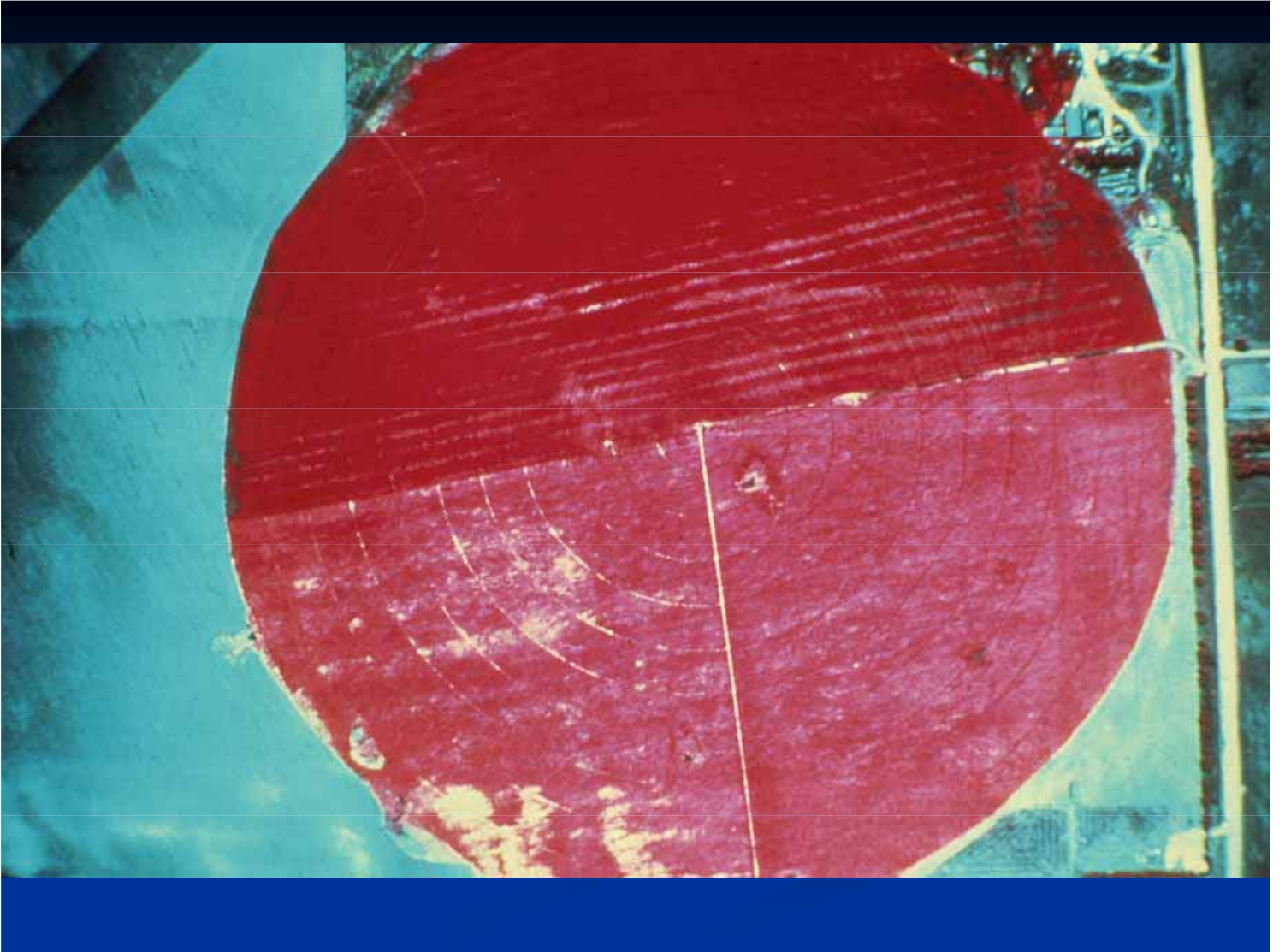
HIGH N STARTERS

**THE
MICROENVIRONMENT
OF N-P BANDS**

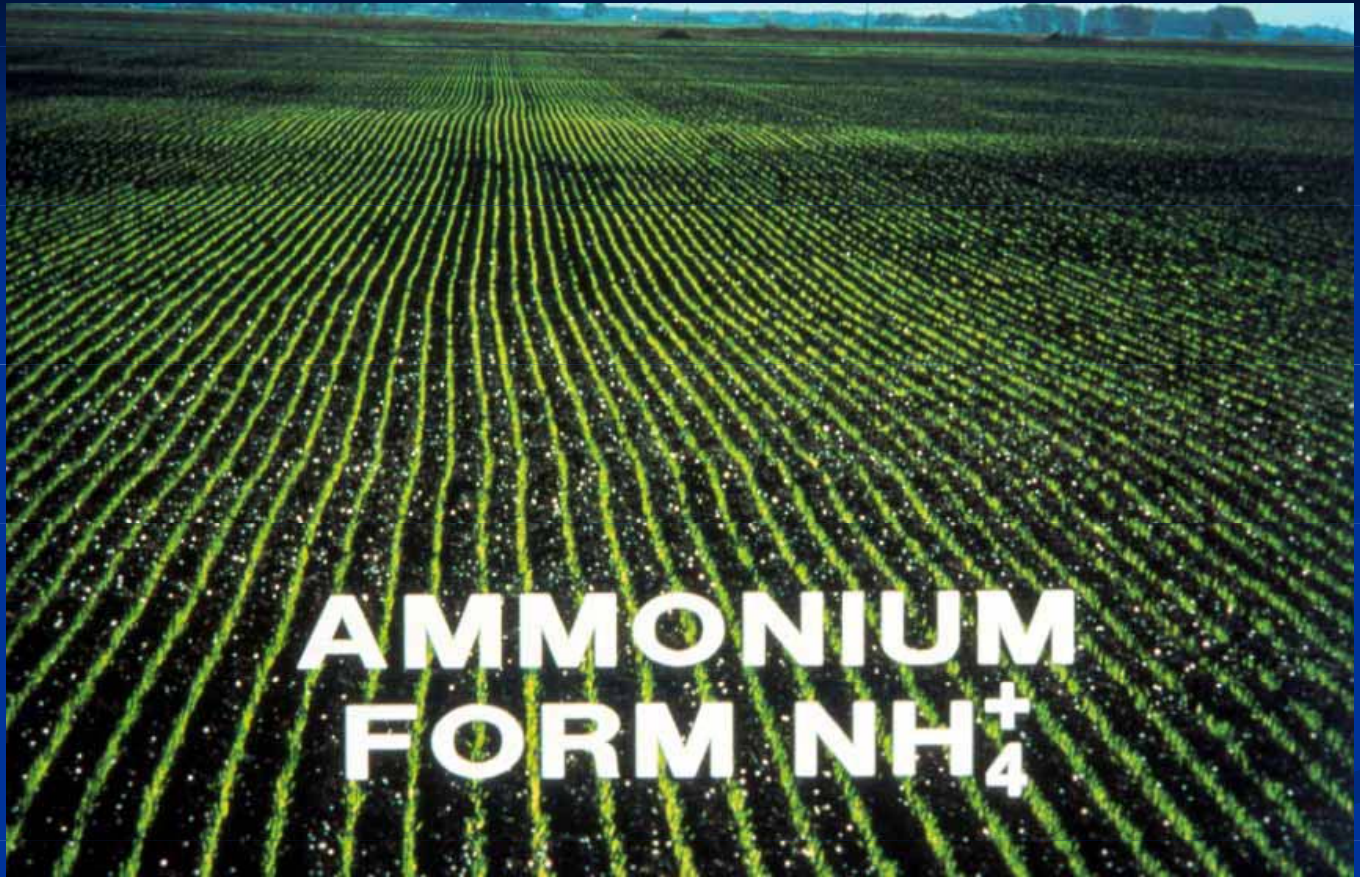


**AMMONIUM
FORM NH_4^+**

**WE'VE UNDERSTOOD
THE VALUE OF
PREPLANT BANDING
OF N AND P FOR 30
YEARS**







**AMMONIUM
FORM NH_4^+**

N Stimulation of P Absorption by Plants

- **Decrease in the rhizosphere pH and increased solubility of soil phosphates.**
- **Increased root length.**
- **Increased physiological capacity of the root to adsorb P. N treatment of corn roots resulted in higher P uptake than a 10-fold increase in P concentration.**

(Kamprath, 1987)

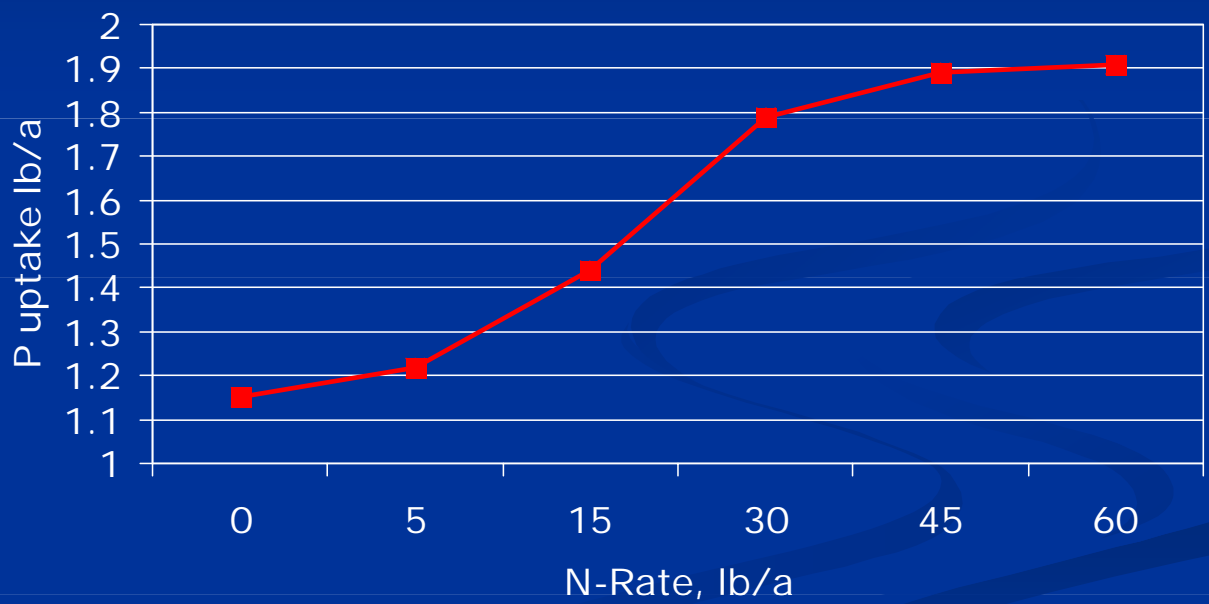
**SOME THINGS WE
HAVE LEARNED
ABOUT STARTERS IN
KANSAS**

**STARTERS NEED
TO BE MORE
THAN JUST 10-34-0!**

HIGH N STARTERS



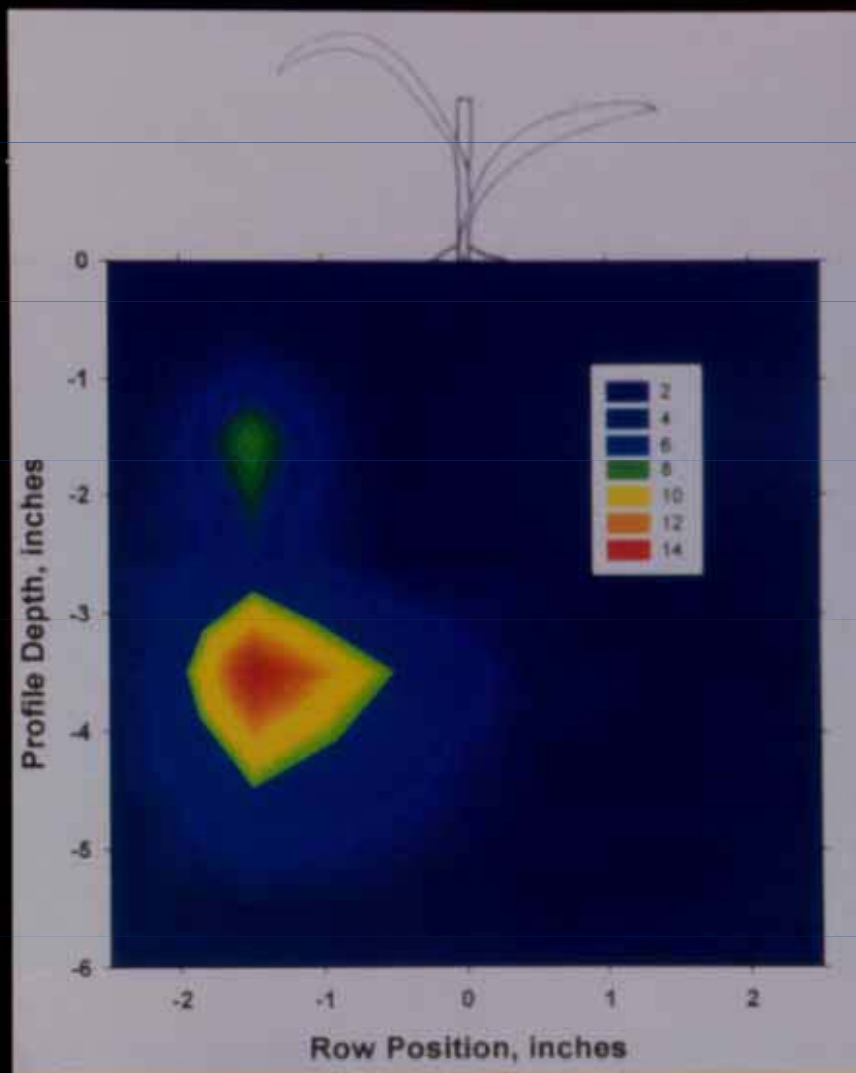
Starter N-Rate Effects on V-6 Stage Whole Plant P Uptake



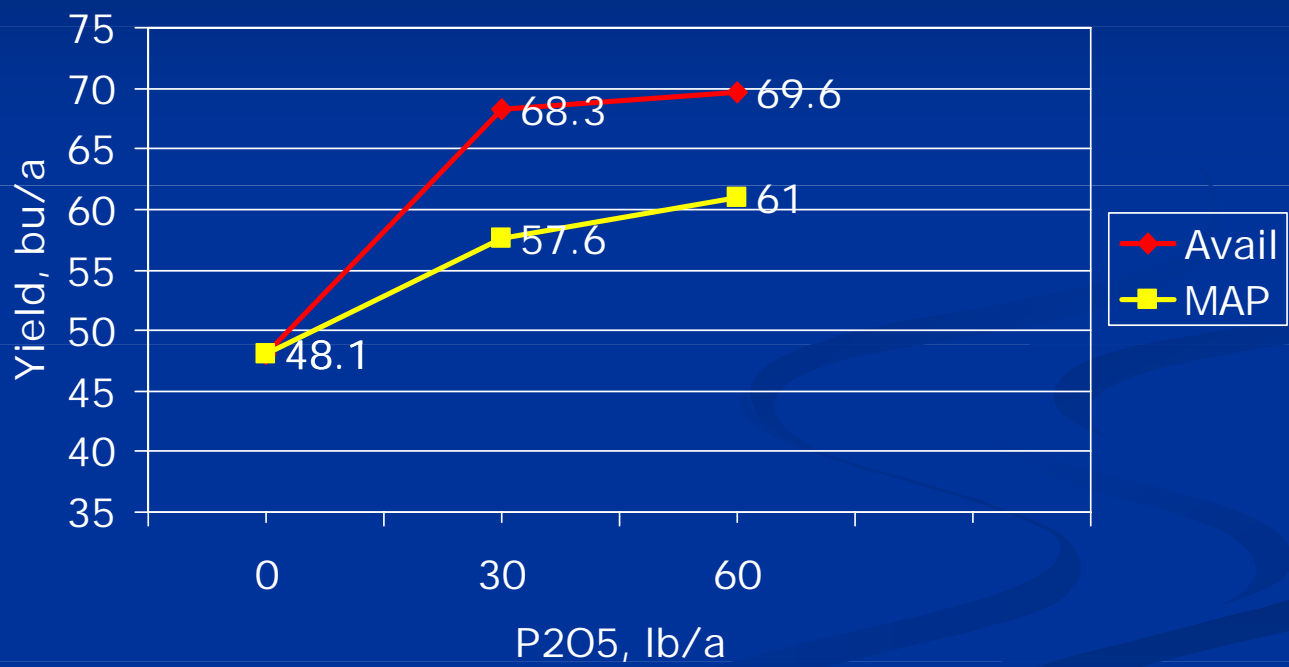
Starter Effects on Corn Yield (bu/a) 3-year avg

Starter	In-furrow	2x2	Dribble	Row Band
5-15-5	172	<i>194</i>	<i>190</i>	<i>179</i>
15-15-5	177	197	198	180
30-15-5	174	<i>216</i>	<i>212</i>	<i>192</i>
45-15-5	171	215	213	195
60-15-5	163	214	213	201
Average	<i>171</i>	<i>207</i>	<i>205</i>	<i>189</i>

HIGH CONCENTRATIONS OF
AMMONIUM N MAY INCREASE
SOIL P MOVEMENT



Avail Soybean Grain Yield 2002-2004



LIMITATIONS TO USE OF HIGH N STARTERS

- **Do not place in direct seed contact. Urea in added N will cause germination damage**
- **Do not place high N starters directly over the row on coarse textured soils. Urea may move into the seed zone**

LIMITATIONS ON SURFACE APPLICATIONS OF STARTERS

- **Limited surface moisture**
- **Positional unavailability of nutrients**
- **How mobile are metals like Zn?**

**RESEARCH SHOWS FLEXIBILITY
IN STARTER PLACEMENT**

Conclusions

- **Dribble applied starter fertilizer as effective as 2x2. In-furrow applied starter reduced plant populations and yields.**
- **Higher N analysis starters maximized grain yields.**
- **Similar results in other states**
- **Seeding equipment can be easily modified for fluid starters at low cost**

**THE IMPORTANCE
OF K IN
STARTERS...EVEN ON
HIGH K SOILS**

**MORE K STRESS IN
REDUCED TILLAGE
SYSTEMS**

MORE K NEEDED WITH:

- **DROUTH STRESS**
- **EXCESS MOISTURE**
- **LOWER TEMPERATURE**
- **SOIL COMPACTION**
- **REDUCED TILLAGE**

Nutrient Demand of a 225 bu/a Corn Crop and Nutrient Supply from the Soil

	Estimates on Amounts (lb/a) Supplied by			
Nutrient	Demand (lb/a)	Interception	Mass Flow	Diffusion
K	250	6	34	210
N	254	3	206	45
P	60	2	3	55
S	30	2	28	0

**NEED FOR
SUPPLEMENTAL
POTASSIUM IS NOT
ALWAYS PREDICTABLE
BY SOIL TEST**



2x2 Applied Starter, Scandia(2-year avg)

Starter, lb/acre			Yield, bu/acre	V-6 K %
N	P2O5	K		
15	30	0	175	3.41
30	15	0	185	3.38
30	30	0	184	3.42
30	30	5	198	4.88

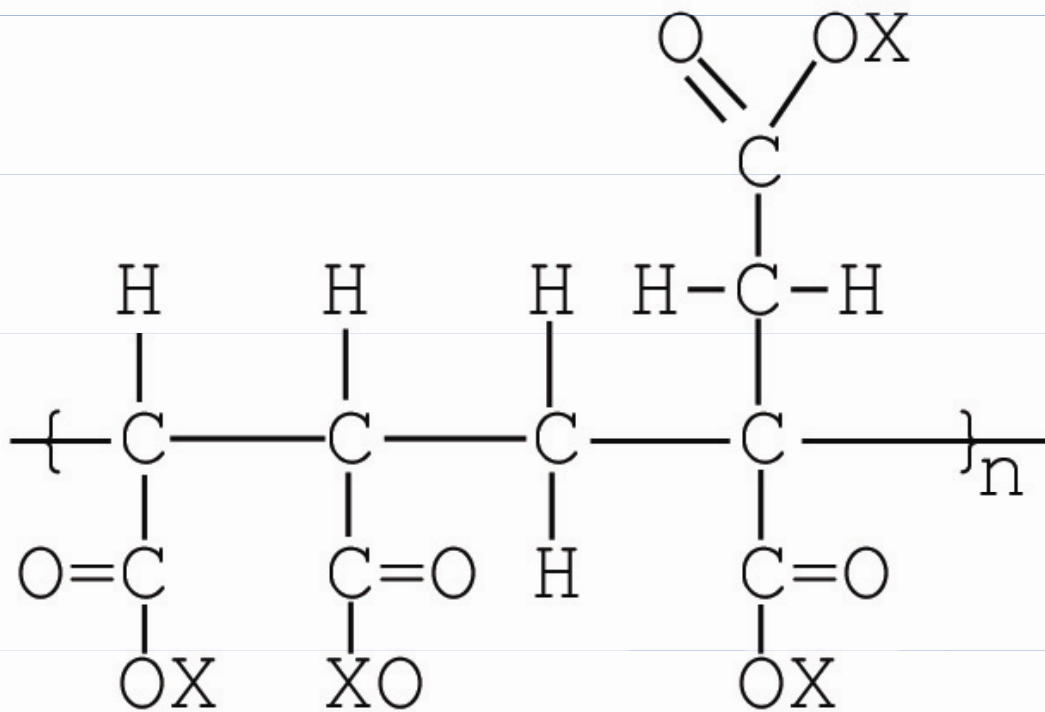
SOIL TESTS INCREASE THE
PROBABILITY OF BEING
RIGHT, BUT ARE NOT
THE LAST WORD

**ADDITION OF NEW
CHEMISTRY TO
STARTERS:
Dicarboxylic co-polymers**

AVAIL

**A POLYMER FOR SOLID AND
FLUID P FERTILIZERS TO
INCREASE PHOSPHORUS USE
EFFICIENCY AND INCREASE
PROFITS**

AVAIL Polymer Chain



AVAIL CHARACTERISTICS

- **An extremely high cation exchange capacity – approximately 1800 milliequivalents /100 gms.**
- **Polymeric structure is very specific to attracting and adsorbing multivalent cations..Al, Fe, Ca, Mg**
- **Functionality is not affected by pH, temperature ranges or ionic strength.**
- **Biodegradable and water soluble.**

AVAIL:

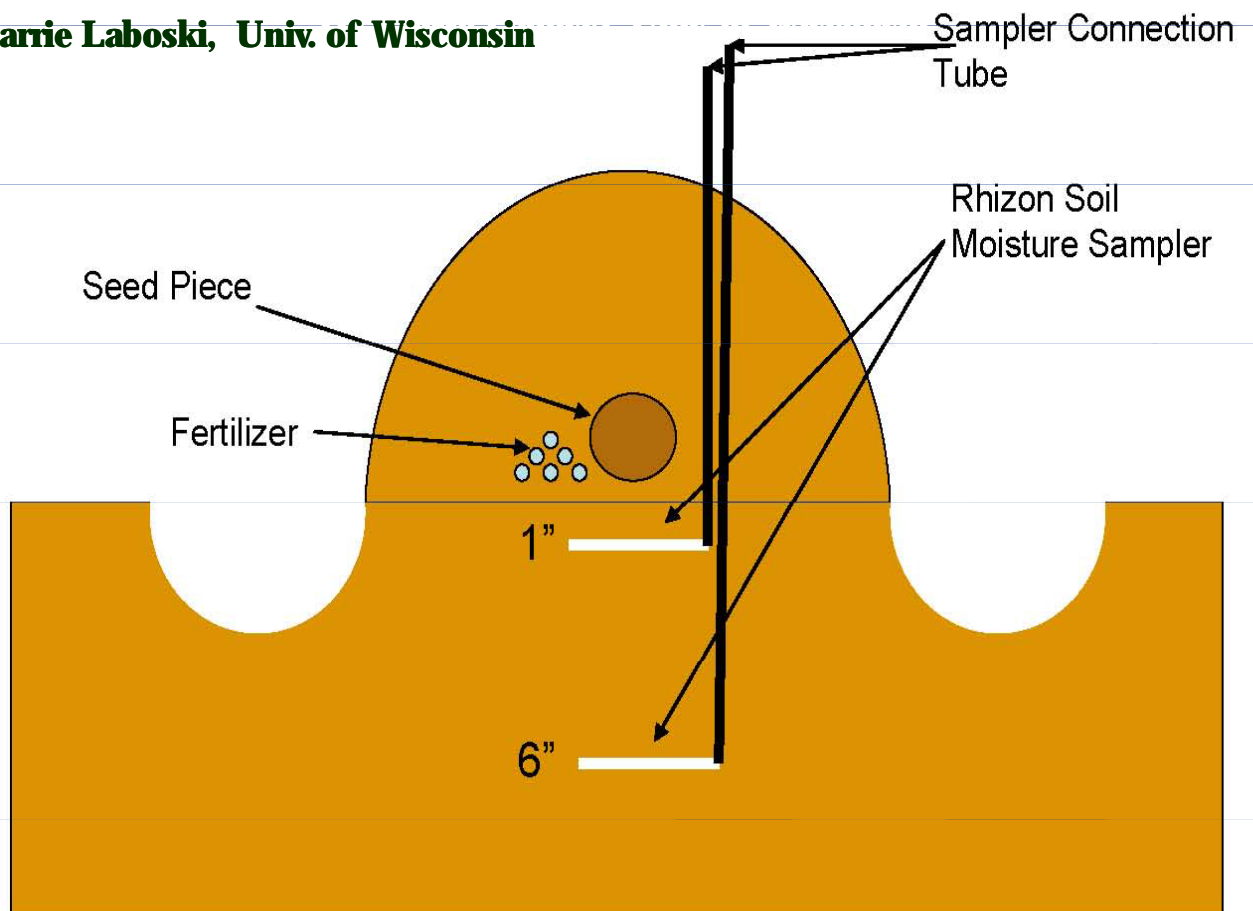
**MODIFICATION OF
MICROENVIRONMENTS
RELATIVE TO P
AVAILABILITY**

RESULT:

- * Enhanced P Availability**
- * Increased P Concentration
in Soil Solution**
- * Increased P Use Efficiency**

SOIL SOLUTION SAMPLING

Dr. Carrie Laboski, Univ. of Wisconsin



UNIVERSITY OF WISCONSIN

Evaluation of P Concentration in Soil Solution

- **Results: “At 1” below seed piece on June 18th(1st flower), July 2nd, and July 16th at Hancock, solution concentrations from MAP+Avail were significantly greater than MAP and control. No difference between treatments at 6”. “**

Dr. Carrie Laboski & Matt Repking
Hancock & Antigo Potato Field Days
Dep. of Soil Science July 18 and 19, 2007
Univ. of Wisconsin-Madison

KSU, North Central Exp. Field

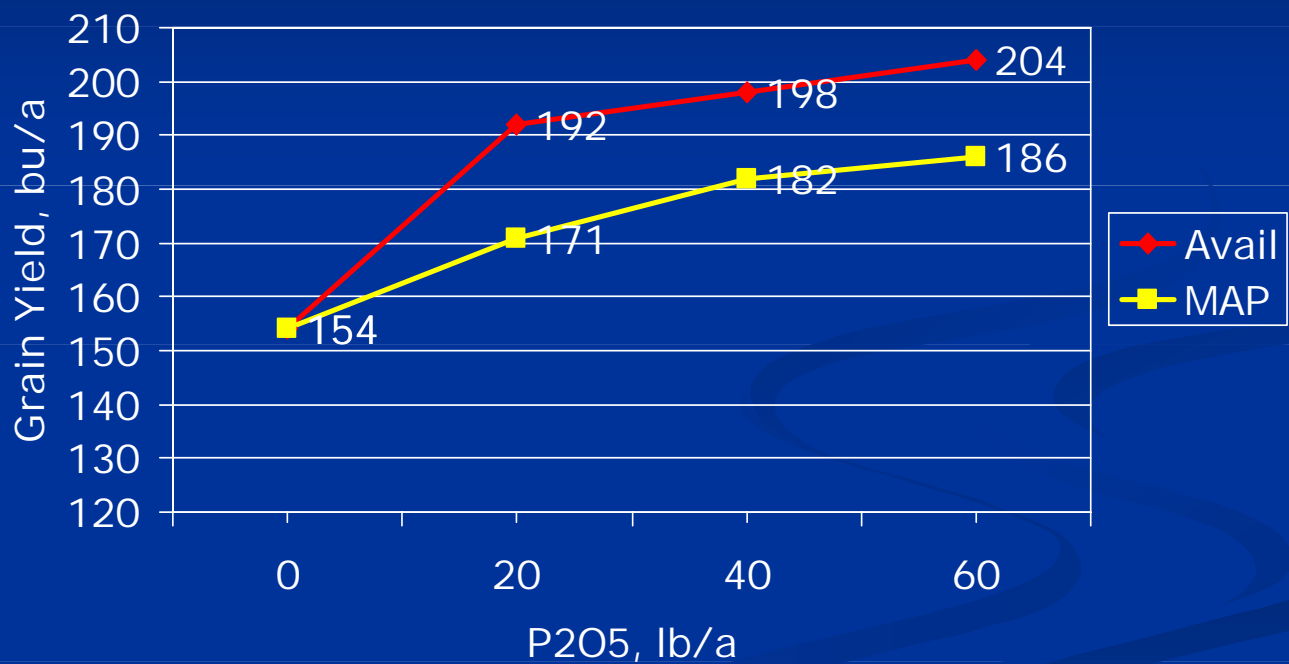
**MAP
STARTER
60 P₂O₅
CK SFP**

NO POLYMER

POLYMER

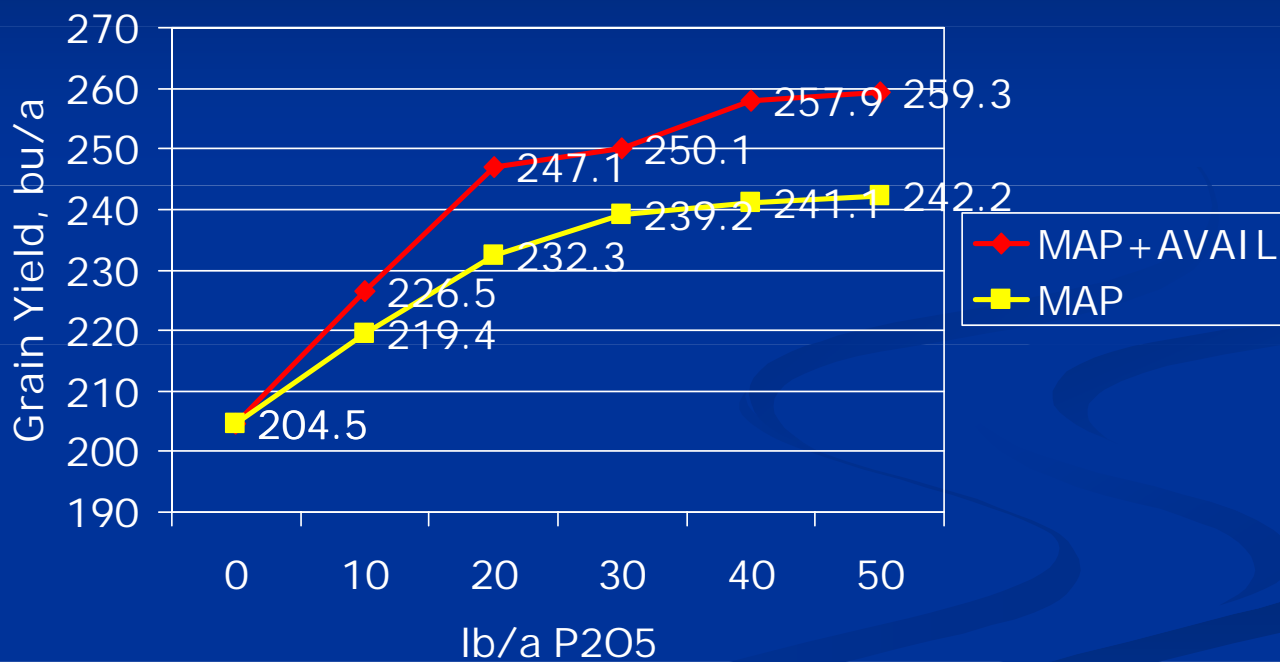


Avail Effects on Corn Grain Yield 2001-2003 Kansas



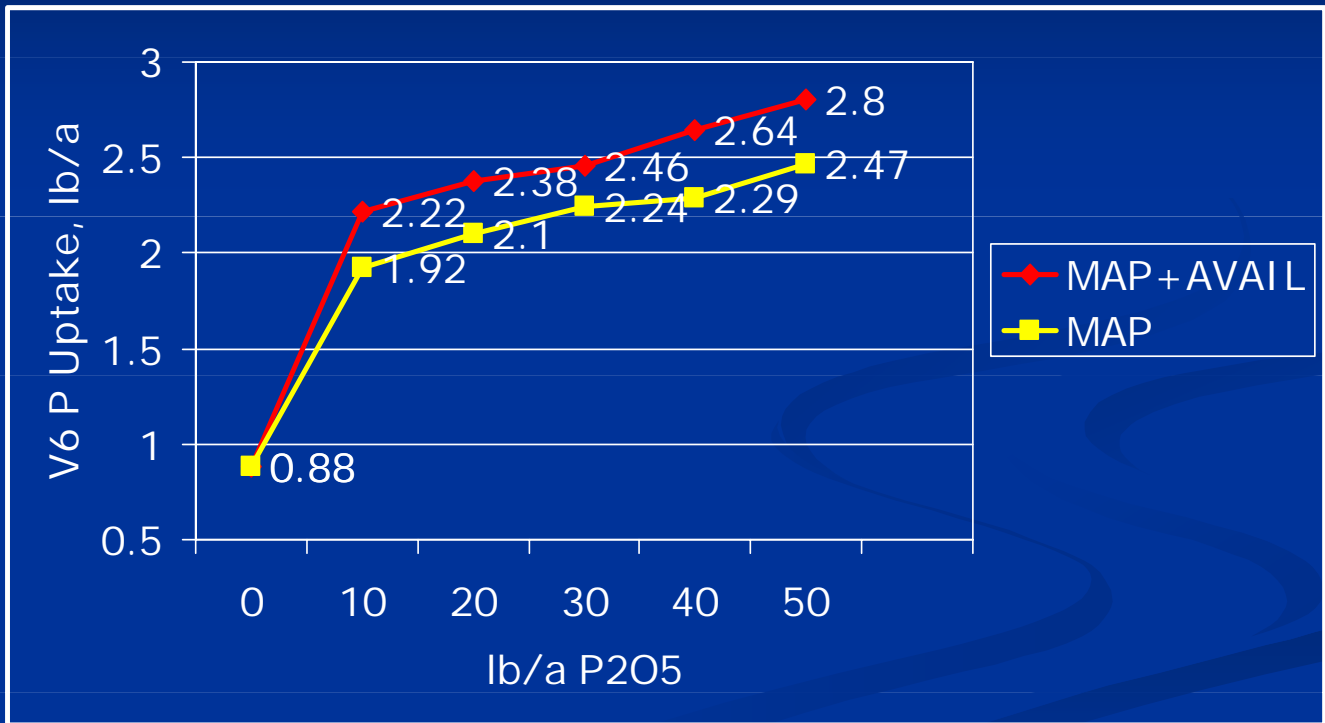
Barney Gordon, KSU

Corn Grain Yield, 2004 Scandia, KS



Barney Gordon, KSU

V6 Whole Plant P Uptake, 2004 Scandia, KS



Barney Gordon, KSU

***EFFECTIVENESS OF
FALL VERSUS SPRING
APPLICATIONS***

FALL-SPRING P APPLICATIONS—2 YEARS

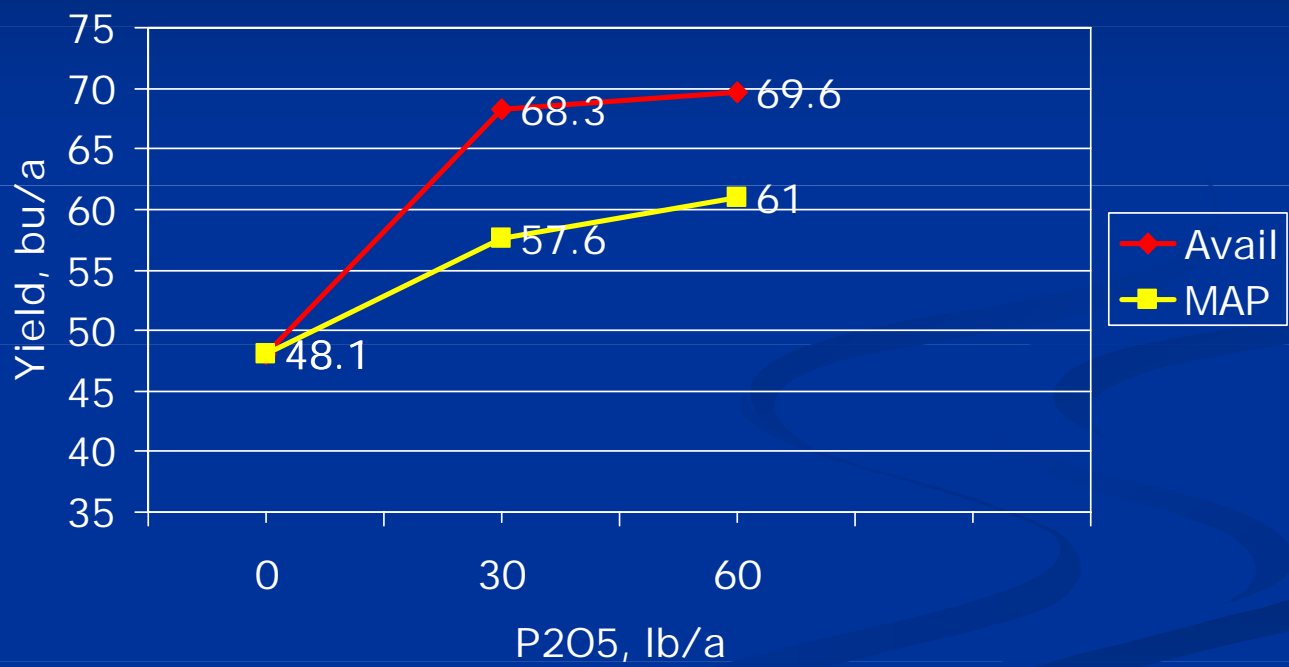
Material	Timing	Yield, bu/acre
Check		178
MAP	Fall	202
	Spring	204
MAP+Avail	Fall	216
	Spring	217

*Average over rates of 30, 60, and 90 lb/a P2O5.

**Bray-1 P=14 ppm

Gordon, KSU

Avail Soybean Grain Yield 2002-2004



AVAIL STUDIES WITH FLUID STARTERS

ENHANCING P AVAILABILITY IN FLUID STARTER - 2002

Treatments				Corn Yield
N	P ₂ O ₅	K ₂ O		
lb/A				bu/A
No starter				133 a
15	15	5	No Avail	152 c
15	15	5	1% Avail	167 b
15	15	5	2% Avail	186 a

Soil pH = 6.8. Soil test P - high.
U.

Gordon, Kansas State

AVAIL EFFECTS IN FLUID STARTER-2004

Treatment	V-6 P Uptake lb/A	Yield buA
No starter	1.5 c	223 c
30+30+5	1.9 b	246 b
30+30+5 + 2%Avail	2.4 a	260 a

Bray 1 P=22 ppm pH=6.2

Gordon, KSU

A photograph of a cornfield in Kansas, showing rows of green corn plants with tassels. The field is viewed from a low angle, looking down a path between the rows. The sky is clear and blue.

KANSAS

AVAIL SD

208 bu/A

FLUID STARTER

8 gal 10-34-0

NO AVAIL

174 bu/A

SUMMARY

- **Avail polymer has been and continues to be effective**
- **Kansas results agree with studies in other states**
- **Delayed P fixation reactions improve P use efficiency**
- **Soil chemistry effect, not crop specific**
- **Cost effective**
- **Large scale use underway**