FERTILITY PLACEMENT FOR CONSERVATION TILLAGE SYSTEMS

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WHY CONSERVATION TILLAGE

- LABOR SAVINGS
- TIME MANAGEMENT
- EQUIPMENT/FUEL COSTS
- SOIL PRODUCTIVITY
- WATER QUALITY
SOIL CONSERVATION IS A SOCIETAL CONCERN

- DEGRADATION OF THE RESOURCE
  - FERTILITY
  - ORGANIC MATTER
  - TILTH
- WATER QUALITY
  - SEDIMENT
  - NUTRIENTS
- PROGRAM COST
  - EXPENSIVE TO MANAGE
  - CHEAPER TO PREVENT
FERTILIZER MANAGEMENT ISSUES IN CONSERVATION TILLAGE

- HOW MUCH - WHAT - WHERE - WHEN
- NUTRIENT STRATIFICATION
- MANURE AND FERTILIZER?
- COMPACTION CONSIDERATIONS
- EQUIPMENT AND PLACEMENT
SOIL TEST TO DETERMINE NUTRIENT NEED

- SAMPLING DEPTH VARIES
  - MULCH TILLAGE: 3/4 DEPTH OF TILLAGE
  - NO-TILL; STRIP-TILL: 6-7"
    - INCLUDE 0-2” SAMPLE FOR pH

- ONCE IN THE ROTATION OR EVERY 3-4 YEARS

- NUMBER OF SAMPLES/FIELD VARIES
  - MINIMUM 10 CORES/SAMPLE
K stratification after 3 years in tillage system

WOLKOWSKI, 2000
**BANDING vs. BROADCAST**

- **BANDING MORE EFFICIENT**
  - LESS FIXATION BY SOIL
  - "PRECISION PLACEMENT"
  - REDUCED RISK FOR LOSS
  - POSITIONALLY AVAILABLE
  - SLOW EARLY PLANT METABOLISM

- **BROADCAST TO CORRECT LOW TESTS**
  - SOME TILLAGE MAY BE NEEDED

- **VOLATILIZATION LOSS FROM UREA CONTAINING MATERIALS**
WHAT ABOUT SEED-PLACEMENT

➢ WISCONSIN SOILS TYPICALLY RESPOND TO ROW-APPLIED FERTILIZER

➢ MANY SOILS TEST IN THE HIGH RANGE

➢ TIME NEEDED TO FILL HOPPERS REDUCES PLANTING EFFICIENCY

➢ SOME SUGGEST HIGHER AVAILABILITY FOR SEED-PLACED MATERIALS
INFLUENCE OF RATE AND TYPE OF SEED-PLACED FERTILIZER

YIELD (bu/a) vs. lb P₂O₅/a

GELDERMAN et al., 1995
INFLUENCE OF RATE AND PLACEMENT OF UREA FERTILIZER ON A SILT LOAM SOIL

WOLKOWSKI, 1999

NO STARTER = 179 bu/a
ALL: 10 lb/a P$_2$O$_5$ AND K$_2$O

N (lb/a)

YIELD (bu/a)

SEED

2 x 2
RECOMMENDATIONS TO REDUCE SEED-PLACED INJURY

- LIMIT TO 10 lb N + K₂O/a
- AVOID HIGH SALT CARRIERS
- NO UREA, UAN, ATS
- USE CAUTION ON SANDY OR DRY SOILS
- AVOID USE ON SALT-SENSITIVE CROPS
WILL MANURE CONFLICT WITH FERTILIZER AND TILLAGE MANAGEMENT

MANURE LAGOON MIXING
USDA-DFRC, 2001
CONSERVATION TILLAGE AND NUTRIENT MANAGEMENT PLANNING

- NMP will allocate manure to more fields on a farm
- Some may be directed toward sloping land
- Rotations and tillage may not be adaptable to manuring
- Credit the manure nutrients
MANURE INCORPORATION TOOLS:
USDA-DFRC FIELD DAY, AUGUST, 2001

NARROW POINT INJECTOR
ROLLING TINE COVERAGE

RELATIVELY AGGRESSIVE
SMOOTH SEEDBED
MANURE INCORPORATION TOOLS:
USDA-DFRC FIELD DAY, AUGUST, 2001

Sweep Injector

Rougher surface, more residue
Watch your step!!
NEED FOR ROW-PLACED FERTILIZER ON MANURED LAND

MOTAVALLI et al., 1993
MANAGE SOIL COMPACTION

- SOIL COMPACTION REDUCES YIELD
- LIMIT UNNECESSARY TRAFFIC, AVOID OPERATIONS ON WET SOILS, LIGHTEN LOADS
- POTASSIUM MANAGEMENT IS IMPORTANT
- SUBSOILING IS NOT A QUICK FIX
RESPONSE OF CORN TO ROW-APPLIED K, OSHKOSH WIS., (3 yr. avg.)

45 lb K₂O/a; 2 x 2 PLACEMENT
STRIP TILLAGE OPTIONS
- FALL vs. SPRING
- SHALLOW vs. DEEP
- LIQUID vs. DRY
THREE MAJOR CATEGORIES AFFECT FERTILITY MANAGEMENT

- **ROW OR RESIDUE CLEARING**
  - REMOVE RESIDUE
  - FINGER COULTERS, BRUSHES, SWEEPS

- **STRIP TILLAGE (SHALLOW: < 6 in.)**
  - MOVE RESIDUE, SEEDBED PREP., ROW FERTILIZER
  - FLUTED COULTERS, DISCS

- **STRIP TILLAGE (DEEP: > 6 in.)**
  - DISRUPT COMPACTION, DEEP-PLACE FERTILIZER
  - KNIVES
  - SOME WITH COULTERS TO MOVE RESIDUE OR CREATE MINI-RIDGES
ROW CLEARING
BANDED PLACEMENT WITH
SEED OR 2 x 2 AT PLANTING
MAIN EFFECT OF ROW FERTILIZER ON CORN GROWTH, ARLINGTON, 1994-1996

MEASUREMENTS TAKEN AT 12 LEAF STAGE
INTERACTIVE EFFECT OF TILLAGE AND ROW FERTILIZER, ARLINGTON, 1994-1996

YIELD (bu/a)

NPK STARTER

- FS
- FZ
- 2x2
INTERACTION BETWEEN STARTER FERTILIZER AND ROW CLEANERS

VETSCH AND RANDALL, 2000 (MN)
DEEP BANDED PLACEMENT IN THE FALL WITH STRIP TILLAGE
PRELIMINARY UW RESEARCH: DEEP STRIP TILLAGE AND FERTILIZER

- ARLINGTON, 2001
- CORN/SOYBEAN ROTATION AND CONTINUOUS CORN
- NO-TILL, FALL CHISEL, FALL STRIP
- BROADCAST, 2 x 2, FALL DEEP PLACED
SOYBEAN RESPONSE TO TILLAGE AND FERTILIZATION, ARLINGTON, 2001

FERTILIZER: 200 lb/a 0-23-30

SOYBEAN AFTER CORN
CORN RESPONSE TO TILLAGE AND FERTILIZATION, ARLINGTON, 2001

CONTINUOUS CORN

FERTILIZER: 200 lb/a 0-23-30
CORN RESPONSE TO TILLAGE AND K FERTILIZATION, KIRKTON, IN

VYN AND JANOVICEK, 2001 (3 yr. avg.)

- = NO STARTER; + = STARTER

FALL K₂O (lb/a)
NO-TILL CORN RESPONSE TO P AND K PLACEMENT (IA)

MALLARINO, 1998
SUMMARY

- Soil test to determine need
- Consider the seed placement risks
- Avoid soil compaction
- Credit manure
- Banded placement more efficient
  - Response potential greater in no-till
  - Use a complete material
  - 10-20-20 minimum
  - Some evidence for deep K placement