About This Presentation

This Power Point presentation was prepared by Dave Lightle, Conservation Agronomist at the Lincoln, Soil Lab as part of the Core 4 Initiative. It has nation wide applicability. Dave is instrumental in developing RUSLE databases.
How To Use This Presentation

- There are valuable notes attached to most of the slides in this presentation which are not seen when slides are viewed in the “View Show” mode. To see the notes, click the “Outline” tab to the left of the screen. Notes are seen at the bottom of the page.
Farm Equipment
Identification and Use

Dave Lightle
Conservation Agronomist
Lincoln, Nebraska
Objectives:

General (At the end of this session, participants will be able):

• Identify certain farm equipment and become familiar with the equipment’s purpose.
• Be familiar with typical equipment used in conventional as well as the various residue management tillage systems.
• Be familiar with the equipment needed for vegetative establishment.
Farm equipment

CONVENTIONAL TILLAGE EQUIPMENT
Moldboard plow
– Conventional tillage
Tandem disk harrow
Field Cultivator
Spike Tooth Harrow
Roller packer or corrugated roller
Bedder Lister
Residue management begins with harvest of the previous crop

- It is much easier to redistribute residue with the harvesting machine than to try to overcome the problems later.
Considerations for Combine Operation

- Leave stubble as high as possible
- Loose residue may blow or float away
- Avoid frequent stops and resulting residue bunches
Straw and Chaff Management

- Avoid making straw and residue windrows
- Retrofit combines with chaff spreaders
- Adjust spreaders to redistribute residue and chaff to as close to full header width as possible
Chaff Spreader Attachment
Residue Related Planting Problems

• Cool, and wet conditions
• Poor control of planting depth
• Inadequate seed-soil contact
• Uneven stands
• Poor seedling vigor
Weed Control Problems

- Weed seed accumulations in residues piles result in weedy spots
- Residue piles may intercept herbicides
- Weed seed germination may be enhanced in moist conditions beneath residue piles
Other Residue Management Considerations

- Rodent problems
- Nutrient tie up
- Shredding stubble
Coulter-knife Anhydrous Applicator

- Minor changes needed to accommodate residue
  - Coulters to cut residue and reduce clogging
  - Closing disks, etc to close the slot and redistribute residue
Manure Management Equipment & Operation

- Surface application often results in loss of nutrients and risk of air and water pollution
- Incorporation is desirable, but disturbs residue and requires lots of power
- Injection is now possible in no-till with new minimal disturbance injection tools such as one from Bazooka
Planting Equipment for No-till

- Purposes
  - open seed furrow
  - meter seed uniformly
  - place seed in the furrow
  - cover the seed
  - firm the seedbed
Coulters

- Cut residue and slice open the seed slot
Coulter types

- **Fluted** - 1 to 1.5 “best with double disk openers on most soils
  - some problems on wet or heavy clay soils
- **Bubble and rippled** - till narrow 0.5 to 0.75” slot
  - better in mulch-till and conventional seedbeds
- **Smooth and notched smooth** - narrowest slot
  - best in sod but don’t till the slot
Multiple coulter systems

- Till a wider seed zone as in zone till and strip till
Coulter placement and depth
Row cleaners

• Clear row ahead of planter unit
• Set to run shallow to move only residue
• Little if any tillage should be done since exposed moist soil is easily compacted by the unit
Double Disk  Staggered Double Disk
Gauge wheels
Conservation Tillage - Equipment

- Double press wheels
- Single press wheel
Conservation Tillage - Equipment
Press wheels and seed firmers

- Heavy cast iron press wheels are useful in no-till except in soils easily compacted.
- Seed firmers are small devices including small wheels or fingers that firm the bottom of the seed trench for better seed placement.
Insecticide equipment
Starter fertilizer 2” to the side and 2” deeper than seed
Planter marking systems

- No-till planter markers need extra weight to cut through residue
- These marks can disturb pesticides and lead to weed escapes
Sprayers for burndown herbicides

- Select nozzles and set pressure to produce large droplets to prevent drift
  - 8006 or smaller flat fan nozzles with 30 to 50% overlap
  - TK-5 or smaller flood nozzles pointed down with 100% overlap
  - To reduce drift and increase accuracy set the pressure to 20 to 30 psi and cut speeds to less than 12 mph
Regular Flat Fan Nozzles
Boom set to close - inadequate overlap causes skips
Flood Nozzles

Flooding Flat Fan

Spray overlap can be varied by raising or lowering boom — and by rotating boom.
Drill with coulter caddy
Conservation Tillage - Equipment
Single disk Openers

Gauge wheel and single disk opener

Firming wheel

Cast iron press wheel
Air Seeder

Conservation Tillage - Equipment
Reducing Soil Compaction

Conservation Tillage - Equipment
Paraplow
Mulch-till Equipment
Equipment for Mulch-till

• Three categories
  – subsurface
  – primary
  – secondary
Sub-surface tillage

- Examples:
  - Subsoil chisels, paraplows, vee rippers, disk sub-soilers
- Fracture tillage pans to improve air and water movement
- Operated as deep as 14”
- Often require additional operations to break clods and level the soil
Mulch-till Primary operations

- To loosen and fracture the seedbed
- To cut, size and partially bury residue
- If too much is buried, it is difficult to bring back with secondary operations
- Typical machines
  - Chisel plows, disks, blade plows and in some cases, field cultivators
Chisel plow points

A
B
C
D
E
F
Conservation Tillage - Equipment
Tandem Disk

Harrors

Conservation Tillage - Equipment
Offset Disk Harrow

- Aggressive burial and incorporation
- Rarely used for secondary or seedbed preparation
- Avoid use in fragile residues
Blade Plows

- 3’ to 5’ sweeps run at shallow depths
- typically used in fallow systems to kill weeds and retain mulch and dry soil on top
Secondary tillage tools

- Tandem disks
- Field Cultivators
- Combination finishing tools
Tandem Disks
(secondary)
Combination Tools and Seedbed Finishers

Combinations of finishing attachments
One-pass incorporation and seedbed preparation
Good residue clearance
Other equipment for Mulch-till

- Planters and drills
  - residue managers and row cleaning disks needed to remove residues from row
  - Bubbled coulters are typically used but fluted and rippled coulters may be needed in heavy residues
  - Residue managers and row cleaning disks may also be needed in heavy residues
Other Mulch-till equipment

- Fertilizer applicators may need coulters to cut through residues and closing disks to seal the slot and redistribute residue
- Manure can be either surface spread and lightly incorporated with tillage or injected
Conservation Tillage - Equipment
Ridge-till
Ridge-till Equipment

- Similar to strip-till except planting is done on a ridge
- Ridges are rebuilt with row cultivation
- Ridges are preserved until the next planting season
Harvesting Considerations for Ridge-till

- Combine, tractor and grain cart tire widths and spacing must be changed to run between the ridges.
- Wide flotation tires should be replaced with narrow duals with wide spacers.
- Incidental traffic should be avoided or restricted to end rows or to the same rows traveled by the combine.
Ridge-till Planting Equipment

- A row cleaning device is required to skim the top 1 -2 inches of the ridge
- Disk furrowers, staggered notched disk furrowers, sweeps with trash guards and horizontal disks are available

![Disk Furrowers](image1)
![Staggered and Notched Disk Furrowers](image2)
![Sweep](image3)
![Horizontal Disk](image4)
Ridge-till Planter
Specialized Equipment for Ridge-till

- Planters can be equipped with spray equipment to band spray chemicals during planting
Specialized Equipment for RidgeTill

- The ridge-till cultivator cleans the row middles and rebuilds the ridges
Specialized equipment for ridge-till

- All traffic is confined to the same rows but compaction can result.
- Between row subsoilers can alleviate this compaction if done when soils are dry.
- Fertilizer and manure application equipment is the same as discussed under No-till except for preservation of the ridge geometry.
Farm Equipment

• Relationship to models and evaluation tools
  – RUSLE2
  – Soil Conditioning Index
  – Soil Tillage Intensity Rating
  – Manure Management Planner
  – Wind Erosion Equation
  – Energy Calculator
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# Conservation Tillage - Equipment

Management: CMZ 01\a.Single Year/Single Crop Templates\Corn grain\corn grain w/manure; FC, st pt, disk, z1

<table>
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<th>Graphic</th>
<th>Rel. row grade, %</th>
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Build new rotation using this management: [Open]

Rotation builder for this management: [Open]

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<th>Date, m/d/y</th>
<th>Operation</th>
<th>Vegetation</th>
<th>Yield (ft/harv units)</th>
<th>External residue</th>
<th>Surf. res. add./remove,</th>
<th>Cover from addition, %</th>
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Specific Outcomes:

At the end of this session students will:

• Have an understanding of farm equipment and that will enable the employee to relate to the client.
• Understand the effects of equipment used in conventional tillage.
• Be able to offer alternatives that will improve the resource concern.
• Understand the particular equipment needed for successful implementation of residue management systems.
• Be able to provide technical assistance to clients that will improve the resource concern.