Unit D: Agricultural Equipment Systems

Lesson 2: Operating, Calibrating, and Maintaining Agricultural Tillage Systems and Equipment
Terms

- Clean tillage
- Compaction
- Conservation tillage
- Floatation
- Minimum tillage
- Mulch tillage
- Power hop
- Primary tillage
- Secondary tillage
- Tillage
- Traction
Objective #1

What is the purpose of tillage systems and equipment used in agriculture?
General Tillage Goals

CONSERVE ENERGY
• Tractors
• Tillage
• Harvest and transport
• Crop drying
• Fuel storage and handling
• Alternate energy sources

WATER MANAGEMENT
• Water management
• Irrigation
• Drainage

CONSERVE SOIL
• Cover crop
• Strip crop
• Crop rotation
• Residue management
• Tillage
• Contour furrows
• Terraces
• Windbreaks
• Mulch and manure
What is *tillage*?

- Mechanical, soil stirring actions carried on for the purposes of nurturing crops

*Primary tillage*
- A deep, at least 6”, operation that loosens the soil to reduce soil strength and mix residue and fertilizers into tilled layer

*Secondary tillage*
- Used to kill weeds, cut and cover crop residue, incorporate herbicides and prepare a pulverized seedbed at a depth 5” or less
Tillage Equipment

- Chisel Plow
- Subsoiler or V-Ripper
- Disk
- Plow
Tillage Equipment

Disk Harrow

Field Cultivator

Row-Crop Cultivator

Combination Tool

Rotary Hoe
Objective #2

What tillage systems and equipment are used in agriculture?
Tillage Systems

• **Conservation tillage**
  – Field operations required for profitable crop production while minimizing soil erosion
  – Leaves at least 30% residue cover

• **Conventional tillage**
  – Sequence of tillage operations traditionally used in your area
  – Leaves less than 15% residue cover
Tillage Systems

• *Clean tillage*
  – Operations which prepares a seedbed having essentially no residue on the surface

• *Minimum tillage*
  – Minimum soil manipulation necessary for crop production
Tillage Systems

• Reduced tillage
  – Less intensive and less aggressive than conventional
  – Number of operations is decreased or tillage implements require less energy

• Mulch-till
  – Conservation tillage that tills the entire soil surface
  – At least 30% of residue remaining
Objective #3

How is tillage equipment calibrated?
Traction, flotation, soil compaction

• **Traction**
  – Linear force, pull or draft resulting from torque applied to tractor tires

• **Floatation**
  – Ability of tires to stay on top of the soil surface

• **Compaction**
  – Firming of soil caused by wheel traffic
Adding weights to the tractor

- Additional weights may be required to gain maximum drawbar pull and sufficient traction.
- Adding ballast (weight) to drive wheels and front end most common way to improve traction.
Effective ballast

• Two-wheel drive tractors
  – Distribute 25 to 35% of weight on front with 75 to 65% of weight on rear

• Mechanical front wheel drive tractors
  – Split 35 to 40% on front and 65 to 60% of weight on rear
Four-wheel drive tractor weights

• Standard towed implements
  – 51 to 55% on front and 49 to 45% on rear

• Hitch mounted implements
  – 55 to 60% on front and 45 to 40% on rear

• Towed implements causing high down loads on drawbar
  – 55 to 65% on front and 45 to 35% on rear
Tire tread indications for proper weighting of the tractor

- Too much weight used
  - Tire tracks are sharp and distinct
- Too little weight is used
  - Tire marks entirely wiped out
- Proper weight
  - Cleats in tire pattern is shifted but tread pattern is visible
Balancing tractors

• *Power hop*
  – MFWD and 4WD tractors may experience simultaneous loss of traction and a bouncing, pitching ride under high drawbar loads
Considerations for tillage implements

- Properly adjust implements to save time and fuel
- Most problems with tillage tools caused by improper adjustment or faulty component
- Instructions in owner’s manual should be followed to obtain top performance
- Problems can be prevented with simple maintenance at the beginning of the season
Safety Considerations

• No safety device can replace a careful operator
• Match equipment to the tractor
• Provide proper tractor ballast and weight split for tractor stability
• Match hydraulic connects
• Park implement on a firm flat surface
• Don’t permit people between tractor and implement
Safety

• Always lower implement to ground when not in use
• If working on equipment in raised position, block so it won’t fall
• Use proper size pins and secure with a clip
• Never carry riders on tractor or implement
• Check wings before transporting
• Transport in narrowest configuration
Objective #4

How is tillage equipment maintained?
Preventative Maintenance

- Minimizes the chances for breakage, costly repair bills, and loss of time
- All moving parts in Contact with other parts require lubrication at point of contact
- If dirt will collect do not lubricate as the dirt will wear the part faster
Preventative Maintenance

• Consult operator’s manual for lubricating instructions and location
• Proper use of field machinery decreases operating costs
• Checking & repairing machinery during off season saves time & money
Simple Maintenance Operations

- Lubricate according to instructions, clean grease fittings to avoid forcing dirt into bearings
- Clean, inspect, and lubricate or repack wheel and coulter bearings
- Examine hydraulic hoses, couplings, and cylinders for wear, damage or leaks
- Check for loose or missing bolts and nuts
More maintenance

• Replace worn, dull, or cracked soil engaging components
• Check and replace bent or cracked components
• Check alignment of soil engaging parts
  – Level the implement side to side and fore and aft
  – Measure vertical distances to check
• Check safety trips and reset mechanism
• Make certain all tires are inflated
Review

• What is the purpose of tillage systems and equipment used in agriculture?
• What tillage systems and equipment are used in agriculture?
• How is tillage equipment calibrated?
• How is tillage equipment maintained?