

# 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



Combination Tool



Field Cultivator



Row-Crop Cultivator



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



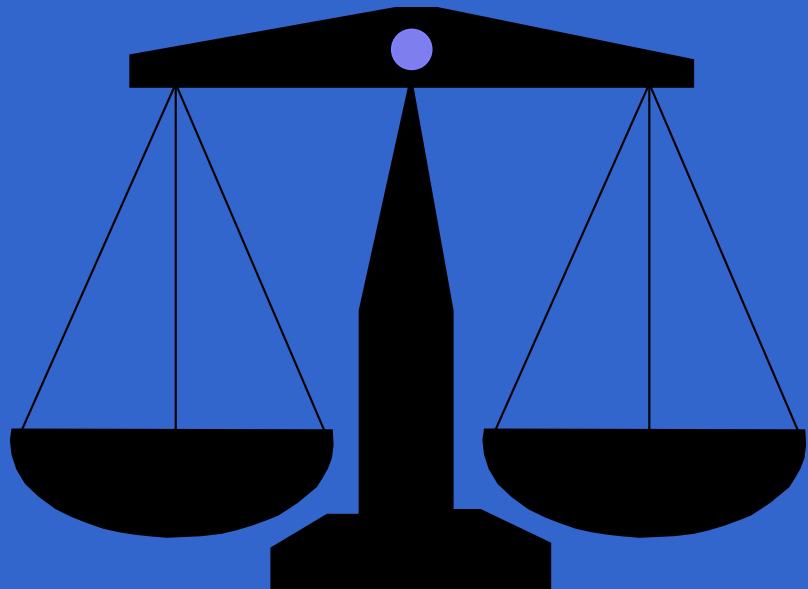
# Objective #3

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

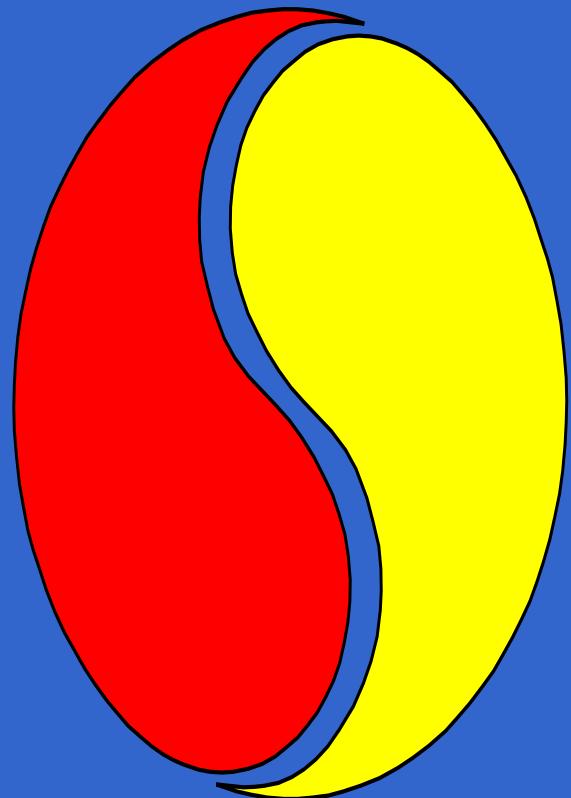
- Two-wheel drive tractors
  - Distribute 25 to 35% of weight on front with 75 to 65% of weight on rear
- Mechanical front wheel drive tractors
  - Split 35 to 40% on front and 65 to 60% of weight on rear

# Four-wheel drive tractor weights

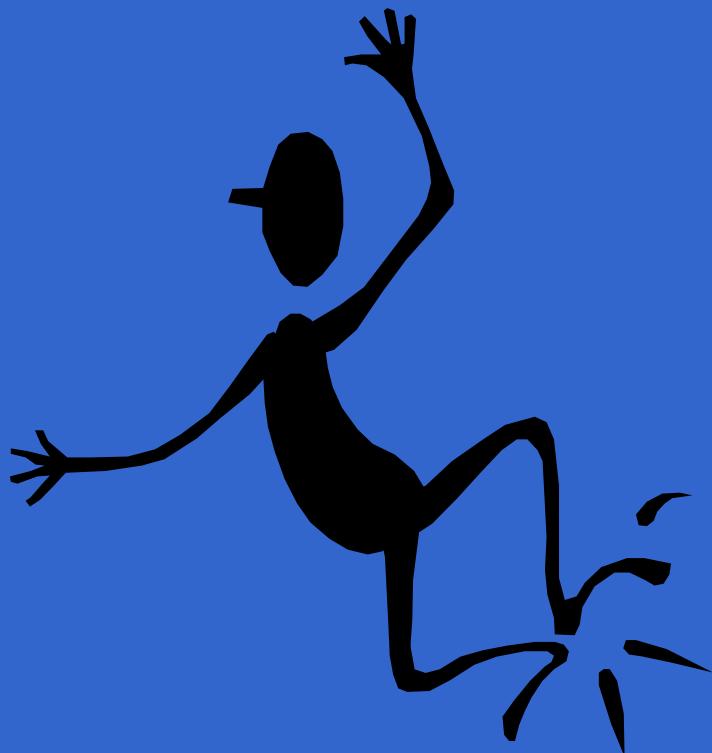
- Standard towed implements
  - 51 to 55% on front and 49 to 45% on rear
- Hitch mounted implements
  - 55 to 60 % on front and 45 to 40% on rear
- Towed implements causing high down loads on drawbar
  - 55 to 65% on front and 45 to 35% on rear

# 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?