

Unit D: Agricultural Equipment Systems

Lesson 8: Operating, Calibrating, and Maintaining Feed Handling Systems

Student Learning Objectives:

Instruction in this lesson should result in students achieving the following objectives:

1. Describe the operation of feed handling systems.
2. Explain the calibration of feed handling systems.
3. Describe the maintenance of feed handling systems.

Recommended Teaching Time: 2 hours

Recommended Resources: The following resources may be useful in teaching this lesson:

Beef Housing and Equipment Handbook (MWPS-6). Ames, Iowa: Midwest Plan Service, Iowa State University, 1995.

List of Equipment, Tools, Supplies, and Facilities:

- Writing surface
- PowerPoint Projector
- PowerPoint Slides
- Transparency Masters
- Copies of student worksheets
- Feed samples
- Feed grinding equipment

Terms: The following terms are presented in this lesson (shown in bold italics and on PowerPoint Slide 2):

- Forage
- Palatability
- Pneumatic
- Roughage

Interest Approach:

Ask students how feed is delivered to animals. Lead a class discussion concerning the ways feed is delivered to animals.

SUMMARY OF CONTENT AND TEACHING STRATEGIES

Objective 1: Describe the operation of feed handling systems.

Anticipated Problem: How are feed handling systems operated?

(PowerPoint Slide 3)

- I. The type of feed being fed affects the type of feeding equipment that is used.

(PowerPoint Slide 4)

- A. **Roughage** or **forage** is material that is bulky and high in fiber.

(PowerPoint Slide 5)

1. Loose hay, small and large hay bales, and stacks can be fed in self-feeders or spread on clean ground. Self-feeding hay can cause high feed losses of up to 50 percent. Trampling creates mud and usually kills vegetation when self-fed is used in the field. Hay waste can be reduced 5 to 10 percent by controlling animal access to the hay. The type of hay feeding equipment used can limit their access.

(PowerPoint Slide 6)

2. Dry-chopped hay, haylage, and silage require a bunk. Bunks are made of wood, concrete, steel, or rubber and are used to hold the feed before, during, and after it is eaten.

(PowerPoint Slide 7)

3. Fence line bunks are located along the side of a lot and are filled with side unloading wagons or truck mounted feeder boxes from the outside of the lot. They require twice as much bunk length as bunks that feed from both sides.

(PowerPoint Slide 8)

4. Mechanical bunks usually allow feeding from both sides and can be used as lot dividers. Conveyors and mechanical bunks reduce feeding time and labor, but are more expensive than fence line bunks due to the automation used to operate them. Cover mechanical bunks to protect equipment and feed, and provide a backup system in case of electrical or equipment failure.

(PowerPoint Slide 9)

5. Portable bunks allow feeding from both sides and are moveable. Unless tied together or anchored, portable bunks can be pushed around by the animals.

(PowerPoint Slide 10)

6. Self-feeding systems include haystacks, silage from plastic bags, and grain and mixed rations in bunks or self-feeders. Feeders can be filled with portable mixer wagons, truck mounted feeder boxes, or overhead augers from outside the lot.

(PowerPoint Slide 11)

B. Energy feeds and protein supplements are the other types of feeds that are fed.

1. Grain and cottonseed meal are some examples. It is recommended these feeds be fed in a bunk or self-feeder. The same bunk used for roughage can be used for grain.

(PowerPoint Slides 12 and 13)

2. Drainage holes are necessary in bunks to remove rainwater, but if they are too large some feed is lost on the ground.
3. Self-feeders are wood or metal structures that hold about four days worth of feed for maximum palatability. **Palatability** means that the feed tastes good to the animal. The feed is offered free choice and the animal can consume as much as it wants.
4. Floor feeding requires more management for maximum productivity without feed loss.

(PowerPoint Slide 14)

C. A feed center provides for receiving, drying, storing, unloading, elevating, and conveying. It also provides for processing grain and additives.

(PowerPoint Slide 15)

1. Feed processing involves grinding grain, weighing or metering ingredients, mixing ingredients, and delivery to bulk tanks or feeders.

(PowerPoint Slide 16)

2. Batch feed processing involves weighing, grinding, and mixing individual ingredients in batches. Batch systems are usually not totally automatic, although some steps can be automated, such as grinding grain into a holding bin and automatic delivery of feed batches.

(PowerPoint Slide 17)

3. Continuous flow feed processing involves milling grain and blending with other rations automatically. Switches stop the mill when the supply of any ingredient is exhausted or when the bin to which feed is being delivered is full.

(PowerPoint Slide 18)

4. Portable grinder-mixers are versatile; they can collect ingredients from a number of locations and process feed in batches. Grinding, mixing, and delivery are done by one machine.

(PowerPoint Slide 19)

5. A mill with portable mixers use a stationary or portable mill that grinds the grain in individual batches as needed. A portable mixer collects the ingredients, mixes the ration, and delivers it to bulk tanks or feeders in batches.

(PowerPoint Slides 20 and 21)

6. A stationary mill with a mixer offers good control over feed ration composition. A wagon or truck delivers the feed to bulk tanks or feeders. For large operations, feed is delivered by high capacity pneumatic systems or by high capacity overhead conveyors. **Pneumatic** systems,

systems that convey by an airstream, are convenient but have high-energy requirements.

(PowerPoint Slide 22)

7. Automatic electric mills are reliable, accurate, and have low labor and operating costs. The mill meters the ingredients into the grinding chamber where they are mixed. Grain and other ingredients must be stored close to the mill and a separate means of feed delivery is required.

(PowerPoint Slides 23, 24, and 25)

8. Hay mills and tub grinders are used to process roughage. Hay and straw can be handled with a forage harvester, stacking wagon, or in large or small bales. Although more wasteful, self-feeding roughage eliminates processing. Processing roughage and mixing it with the grain allows more even consumption.
9. Hay mills shred and screen solid bales of hay or straw. Tub grinders have a large tub that rotates slowly and feeds a constant supply of roughage to a hammermill in the floor of the grinder. After the roughage is screened, it can be piled on the ground or loaded in a wagon for distribution.

Use TM: 8-1 (PowerPoint Slide 26) to illustrate different types of feeders.

Loading, weighing, and mixing is illustrated in TM: 8-2 (PowerPoint Slide 27). To assist in discussion of alternative grinding systems, use TM: 8-3 (PowerPoint Slide 28).

Objective 2: Explain the calibration of feed handling systems.

Anticipated Problem: How are feed handling systems calibrated?

(PowerPoint Slides 29 and 30)

- II. Feed handling systems are designed to be efficient and convenient. In order to be efficient, all the steps in the feed handling and processing operations require close monitoring.

(PowerPoint Slide 31)

- A. Rations require accuracy in metering, processing, grinding, and mixing ingredients for feed. Initial settings for equipment can be found using tables provided by the equipment manufacturer.

(PowerPoint Slide 32)

- B. Feed samples should be sent for testing to insure that the feed contains the proper quantities of nutrients and additives. If the feed is not ground sufficiently or if it is ground too much, change the screen in the mill.

(PowerPoint Slide 33)

- C. When dispensing feed in bunks, effort and care must be taken to spread the material evenly throughout the entire bunk.

(PowerPoint Slide 34)

- D. Through daily observation, a careful operator knows whether the feeders are set correctly. If there is excess feed on the ground around the feeder, the setting on the feeder is open too much. If the feeder is completely cleaned-up, not enough of an opening is present to allow the proper feed flow.

Discuss the problems that may arise if feeding systems are not working properly. Be sure to include economic reasons.

Objective 3: Describe the maintenance of feed handling systems.

Anticipated Problem: How are feed handling systems maintained?

(PowerPoint Slides 35 and 36)

III. For feed handling systems to function properly, proper maintenance of equipment must be followed. Adequate and timely adjustment, repair, lubrication, protection from the weather, and proper clean-up determine the life of a machine.

(PowerPoint Slide 37)

A. It is important to select the proper lubricant for the different parts of machines. Consideration must be given to the function each part has to perform. Daily inspection is essential to prolonged life of equipment.

(PowerPoint Slide 38)

B. Repair any loose, bent, or broken parts.

(PowerPoint Slide 39)

C. Consult the operator's manual for lubrication instructions for the machine and for the location of the parts to be lubricated. Locate a lubrication chart for the machine and follow its directions. Use the proper equipment to lubricate the machines and follow established guidelines.

(PowerPoint Slide 40)

D. There are numerous types and varieties of equipment used in feed handling systems. The maintenance guidelines found in operator's manuals should be used as a guide for determining maintenance.

Relate lubrication of feed systems to that of other equipment. Discuss how they are similar and different.

Review/Summary: Use the student learning objectives to summarize the lesson. **(PowerPoint Slide 41)** Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle.

Also engage the students in a discussion centered on feed handling systems used in Afghanistan. Which of the systems, if any, discussed in the content are used or could be used? Why? What makes one system more suitable than another?

Application: The following lab activity will be helpful to students in applying the content of the lesson.

LS: 8-1 Livestock Grower Interview

Evaluation: Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on the application activity. A sample written test is attached.

Answers to Sample Test:

Matching

1. B
2. A
3. D
4. C

Fill-in-the-blank

1. Fence line
2. Batches
3. Hay mills and tub grinders
4. Testing

Short Answer

1. Grinding grain, weighing or metering ingredients, mixing ingredients, and delivery to bulk tanks or feeders.
2. The animal can consume as much as it wants.

Understanding Principles of Operation of Internal Combustion Engines

Name: _____

Matching: Match each word with the correct definition.

- | | |
|--------------|------------------|
| a. palatable | c. portable bunk |
| b. pneumatic | d. roughage |

- _____ 1. Convey by an airstream.
- _____ 2. The feed tastes good to the animal.
- _____ 3. Material that is bulky and high in fiber.
- _____ 4. Allows feeding from both sides and are moveable.

Fill-in-the-blank: Complete the following statements.

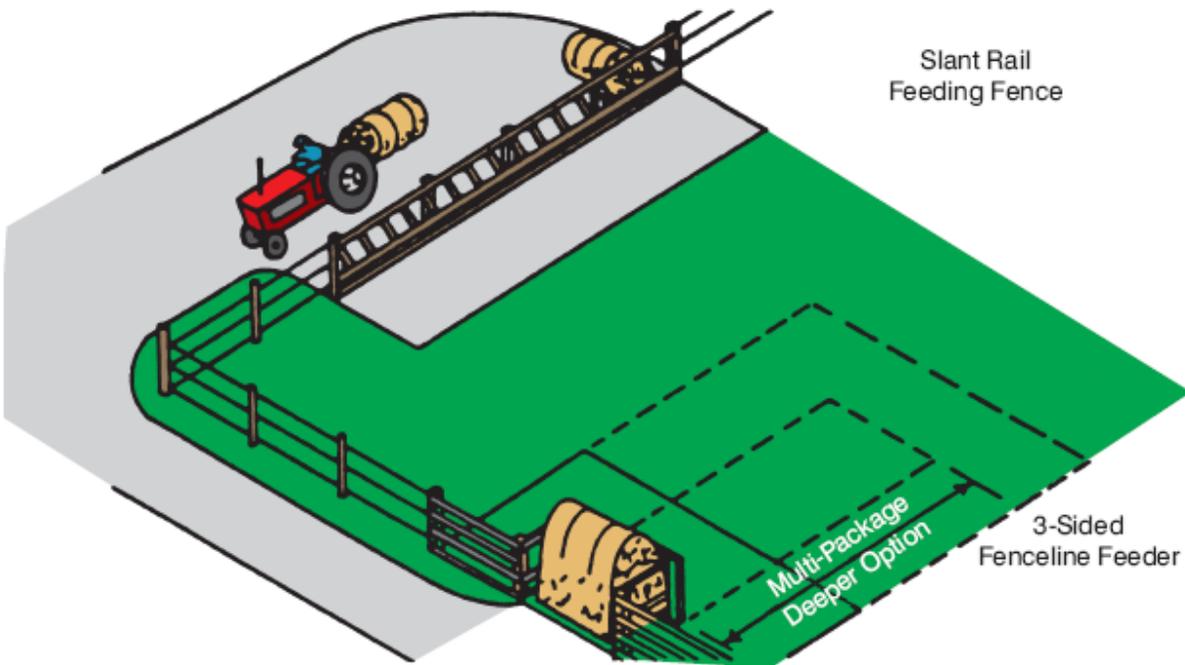
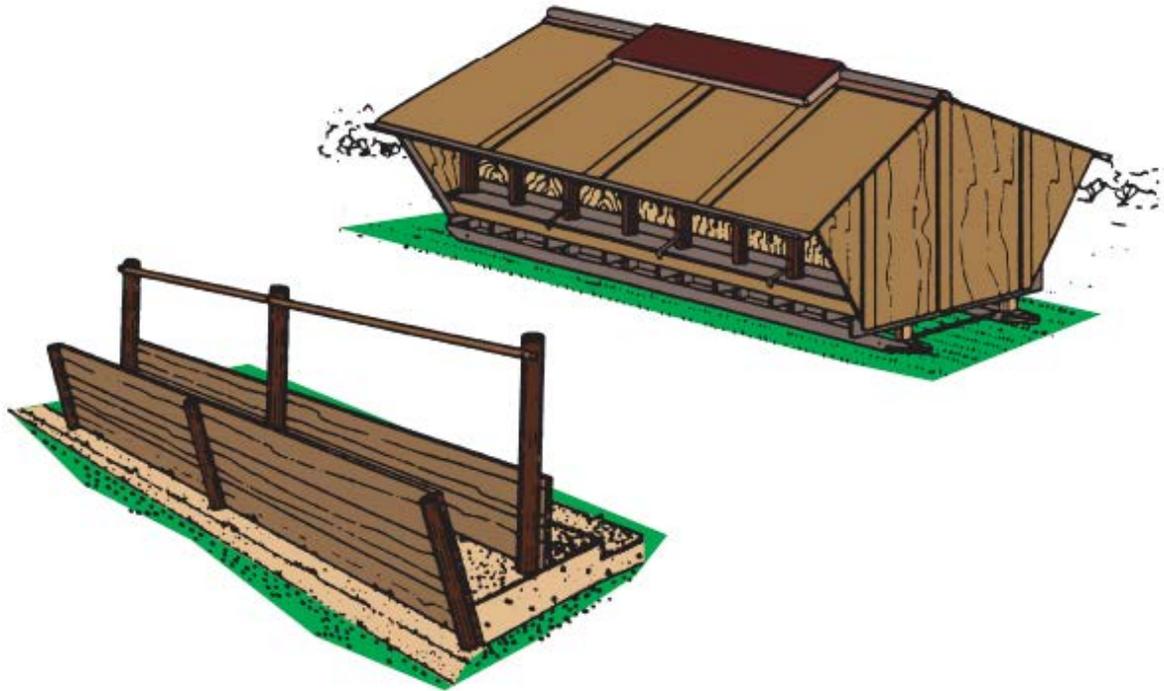
1. _____ bunks require twice as much bunk length as those that feed from both sides.
2. Batch feed processing involves weighing, grinding, and mixing individual ingredients in _____.
3. _____ and _____ are used to process roughage.
4. Feed samples should be sent for _____ to insure that the feed contains the quantities of nutrients and additives it should.

Short Answer: Answer the following question.

1. What does feed processing involve?

2. What does free choice feeding mean?

TYPES OF FEEDERS

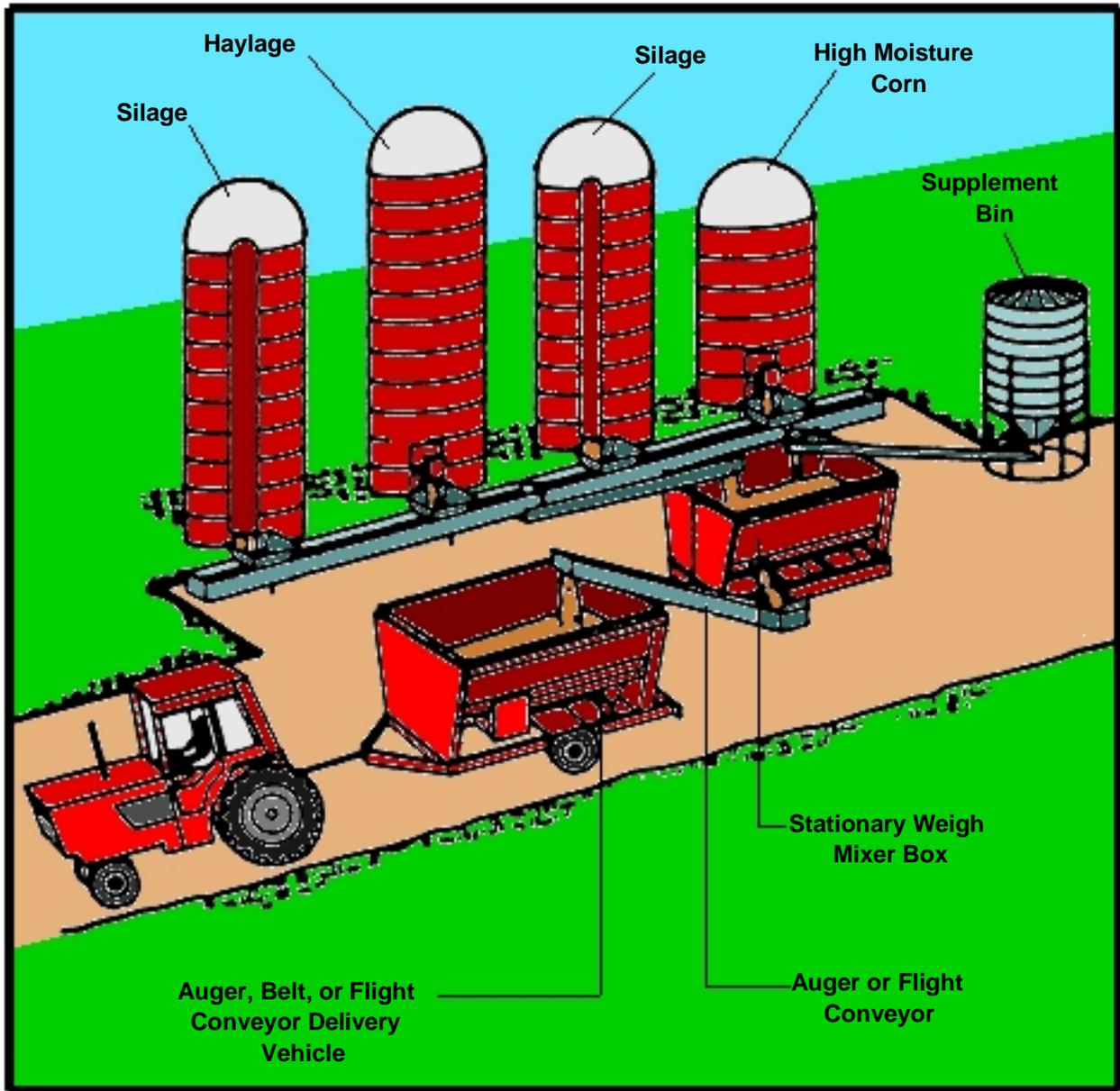


Slant Rail
Feeding Fence

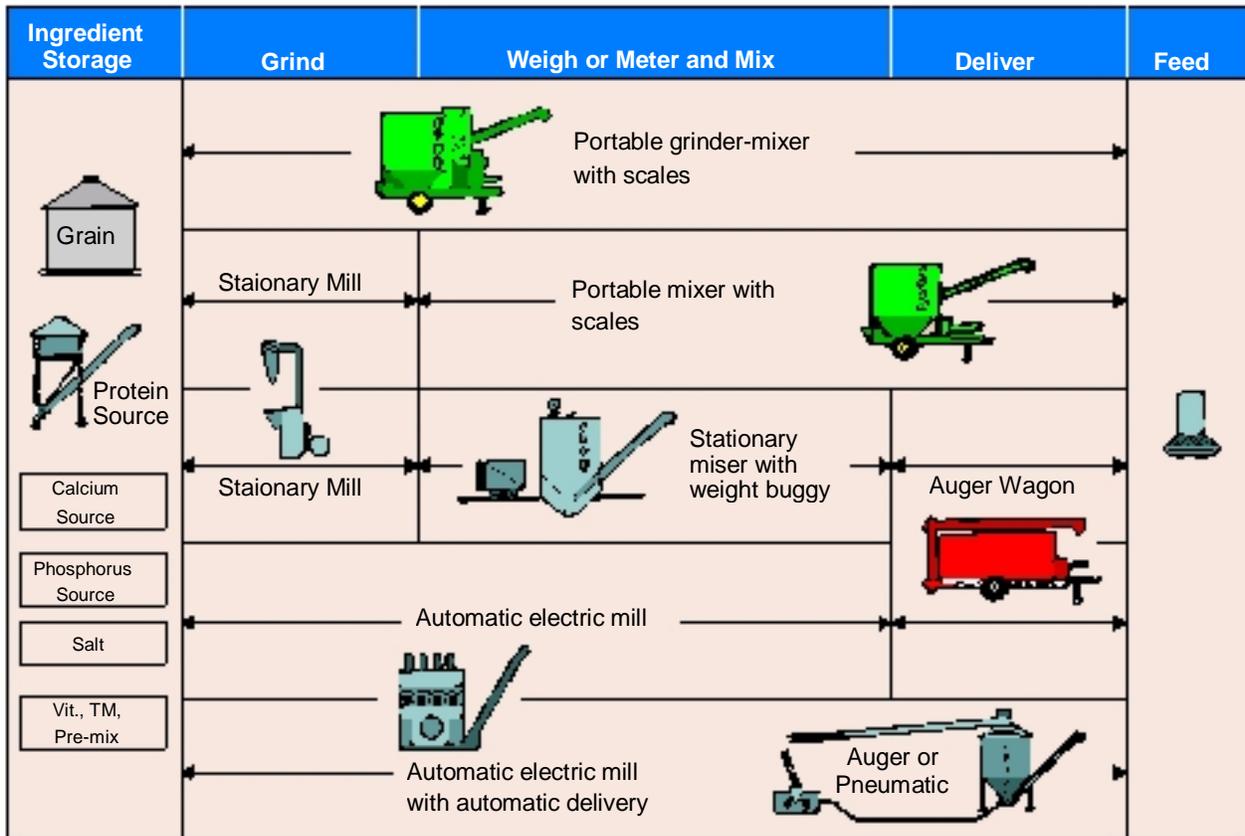
Multi-Package
Deeper Option

3-Sided
Fenceline Feeder

LOADING, WEIGHING, AND MIXING OPERATION



ALTERNATIVE GRINDING— MIXING SYTSEMS



LS: 8-1

LIVESTOCK GROWER INTERVIEW

Find a local livestock grower and interview him/her concerning their feed handling system. Below are a few questions and you must add at least three. Prepare a one to two page report on the information you discovered during the interview. Include a hand-drawn picture of their feed handling system.

1. What type of livestock do you raise?
2. What types of feeds do you feed the livestock?
3. At what weight is the animal to be harvested or used for work?
4. How much feed does it take to get the animal to this weight?
5. What type of feed handling system do you use?
6. What type of feed distribution system do you use?
7. What are two advantages of the system you use?
8. What are two disadvantages of the system you use?