UNIT IX - FORAGE PRODUCTION

Lesson 1: Planning the Crop

**Competency/Objective:** Evaluate local growing conditions for forage production.

**Study Questions**

1. What is a forage?

2. What is the difference between the types of forages?

3. What factors are involved in evaluating a forage site?

**References**

1. *Advanced Crop Science* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 2000, Unit IX.

2. Activity Sheet
   a) AS 1.1: Evaluating Topography and Soil Quality for Forage Crops
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TEACHING PROCEDURES

A. Introduction

Provide an overview of Missouri forage production and how it compares to other types of crop production. The use of forages for the feeding of livestock has been in place since humans first domesticated animals. The first producers in Missouri rapidly capitalized upon the abundant native plants in animal production. Today, over half of the feed given to Missouri livestock is produced in the state.

Forages are the most widely produced crops in the United States with 475 million acres of pasture and rangeland and 61 million acres of hay. They are economically important to Missouri producers as a cash crop as well as in the production of animal and animal products. Also, pasture crops use land that is generally unsuitable for other types of crop production. Forages, especially native grasses, are very hardy and easily grow under a number of different conditions.

B. Motivation

Bring in samples of different plant species (grasses, legumes, forbs, woody plants, flowers, etc.). Have students select the forages from these plants.

C. Assignment

D. Supervised Study

E. Discussion

1. Define the term forage and discuss the three utilized forms in crop production. Ask students to develop a definition of forages; write the student responses on the board and discuss them.

What is a forage?

a) Forage - the vegetative material (leaves and stems) of plants used as livestock feed
   1) Primarily grasses and/or legumes (multiple varieties in Missouri)
   2) Can include grain crops such as corn and grain sorghum or stalks from harvested crops

b) Types of forages
   1) Fresh - pasture
   2) Dried - hay
   3) Ensiled - silage or haylage

2. Have examples of baled hay and fresh pasture grasses. Have students develop a list of factors important to each.

What is the difference between the types of forages?

a) Hay
   1) Requires knowledge in management skills, multiple types of equipment, fertilization, planting, harvesting, transporting, and storage capabilities
   2) Primarily mechanically harvested crop, can be grazed
3) Requires special attention when cutting, drying, and storing to maintain nutrients in crop
   (a) Exposure to rainfall after cutting and before and after baling should be avoided; excessive moisture can cause hay to rot.
   (b) Excessive storage time can deplete nutritional content and palatability; timely use or marketing is recommended.

b) Pasture
   1) Requires specific knowledge and management skills but less equipment needs
   2) Primarily harvested through livestock grazing
   3) Requires fenced and maintained crop area
   4) Permanent pasture - using existing perennial grasses and legumes with or without improvements
      (a) Improved pasture - including fertilizer applications and additional seedings of grasses and/or legumes, especially varieties that extend the grazing season and improve nutritional value
      (b) Unimproved pasture - natural grassland vegetation requiring good grazing management
   5) Temporary or rotational pasture - seeded annually for summer and winter grazing needs or as needed in a double-crop rotation
      (a) Wheat and small grains used for winter and early spring grazing
      (b) Millet and sorghum used for summer grazing
      (c) Stalk fields used after harvest for grazing
      (d) Generally need temporary fencing

c) Silage and haylage
   1) Silage is preserved in moist, succulent conditions by partial fermentation in a tight container.
      (a) The moisture content at harvest is generally greater than 50%.
      (b) A forage harvester is used to chop the crop for easier handling and better packing in a silo.
      (c) There is little to no loss from shattering, leaching, or bleaching.
      (d) There is less dependence on having extended periods of favorable weather.
      (e) Plants used as silage must contain sufficient carbohydrates for fermentation and low amounts of calcium and protein.
      (f) A new method of harvesting is round bale silage using a round baler and storing in a sealed container, usually a plastic bag.
   2) Haylage is forage that could have been cut for hay but is stored with a higher moisture content than hay, but with less moisture than silage.
      (a) The moisture content at harvest is generally greater than 50%.
      (b) Low moisture limits bacterial action.
      (c) High level of carbon dioxide from respiration creates good preservation conditions.
      (d) Haylage is more palatable than high moisture silage.

3. Ask students individually or in groups to list things they would want to consider about a site for both a hay field or pasture. As a class, compare student/group lists and use these to continue the discussion. Have students post their group lists on the board and discuss them. Have students complete AS 1.1 to develop skills in choosing a site for forage crops.

What factors are involved in evaluating a forage site?

a) Intended use of forage
   1) Hay and silage/haylage
      (a) Harvested for later feed use or sale
(b) Need to have higher yield characteristics to offset harvesting and marketing costs
(c) Be able to withstand harvesting pressure

2) Pasture
(a) Consumed directly by animals
(b) Needs to be adapted for rapid growth
(c) Tolerant of hoof traffic and soil compaction
(d) Can utilize poorer soils (poor drainage, dry, etc.)

b) Existing forages or previous crop
1) Existing forages
(a) Introduce species that are complementary to the existing crop
(b) Enhance overall forage quality
2) Previous crop
(a) Aware of previous herbicides, pesticides, insecticides, and fertilizer applications
(b) Establishment of pure forage stand; all previous crops to be effectively removed from field

c) Topography (land limitations)
1) Elevation
(a) Plant species tend to be elevation specific; grow better at some elevations
(b) Not a major concern in Missouri with consistent elevation
2) Slope
(a) Determines erosion hazard
(b) Determines amount of available topsoil
3) Other considerations
(a) Stoniness, weeds, amount of brush, and amount of boggy or marshy soils
(b) Determining factors for forages for harvest or pasture
(c) Affect amount of time and money to establish forage crop

d) Soil
1) Type and texture
(a) Legumes
   (1) Prefer deep loams
   (2) Well-drained soils also acceptable
(b) Grasses
   (1) Less particular about soil conditions
   (2) Some better suited to wet soils, others suited to dry soils
2) Drainage
(a) Many forages tolerant of short duration flooding
(b) Determines forage species that can be planted
   (1) Legumes
      a. Alfalfa requires well-drained soils.
      b. Birdsfoot trefoil tolerates wet, moderately well-drained soils.
      c. Alsike clover tolerates wet locations.
   (2) Grasses
      a. Tall fescue - tolerant of wet soils
      b. Reed canarygrass - adapted to wet/marshy areas
3) Fertility - recommendations for planting based upon soil tests
   (a) pH
      (1) Legumes - 6.5 to 7.5 pH with alfalfa being the most sensitive
      (2) Grasses - more tolerant; prefer 5.5 to 7.0, some with pH ranges as low as 4.0 or as high as 9.0
   (b) Nitrogen (N) - Used as a starter to aid in forage establishment
      (1) Legumes - 10 to 20 lb/acre
      (2) Grasses - 20 to 40 lb/acre
(c) Incorporate phosphorous (P) and potassium (K) before planting - not mobile in the soil
   (1) Optimum P - 140 lb/acre (legumes and grasses)
   (2) Optimum K - 200 lb/acre (legumes and grasses)

F. **Other Activities**

Have a local forage extension specialist discuss with the class important factors in establishing forages.

G. **Conclusion**

Forage production is a major secondary industry in relation to the utilization of forages in livestock production. The decision to establish a forage crop and the factors in determining the types of forages to establish are all major considerations in this decision.

I. **Answers to Activity Sheet**

Answers will vary.

J. **Answers to Evaluation**

1. Fresh (pasture); Dried (hay); Ensiled (silage or haylage)
2. Permanent and temporary or rotational
3. Intended use of forage; existing forages; topography; soil
4. The nutritional content and palatability of baled hay will be gradually depleted with long-term storage.
5. b
6. d
7. c
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EVALUATION

Complete the following short answer questions.

1. What are the three different forage production systems?
   a. 
   b. 
   c. 

2. What are the two types of pastures?
   a. 
   b. 

3. What four factors should be considered before introducing forages into an agricultural system?
   a. 
   b. 
   c. 
   d. 

4. Why is timely use or marketing recommended for baled hay?

Circle the letter that corresponds to the best answer.

5. Pastures are generally harvested ________________________________.
   a. The same way as a grain crop
   b. Through livestock grazing
   c. After exposure to rainfall
   d. By mechanical methods

6. Hay is primarily harvested ________________________________.
   a. The same way as a grain crop
   b. Through livestock grazing
   c. After exposure to rainfall
   d. By mechanical methods

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7. Silage is harvested at a moisture content _____________________________%.
   
a. Less than 50
b. Less than 40
c. Greater than 50
d. Greater than 60
Evaluating Topography and Soil for Forage Crops

Objective: Students will be able to evaluate sites for planning forage crops.

Directions: Using the most recent copy of the Missouri Farm Facts, available from the Missouri Department of Agriculture, determine the acreage, yield, and production of forages in your county. Obtain a topographical map of Missouri or a County Soil Survey and evaluate what type of topography and soil is in your county. Determine how this affects the yield and production of forages in your county. Compare this information to other counties in Missouri.