

Unit D: Production of Field Crops

Lesson 4: Forage Crops

Terms

- Annual
- Blade
- Boot stage
- Culm
- Curing
- Forage
- Heading
- Jointing
- Pasture
- Forb
- Grass
- Hay
- Haylage
- Hay making
- Perennial
- Range
- Rhizomes
- Silage
- Silo
- Stolon
- Tillering

Objective 1

Define and name examples
of grass and legume
forages.

What are grass and legume forages?

- I. *Forage* is vegetation fed to livestock.
 - Forages are crops that are efficiently used by ruminant animals.
 - Forages may be fresh, dried, or ensiled. Fresh forages include grasses and legumes grown in pastures.



What are grass and legume forages?

- A *pasture* is improved or unimproved plant material on land areas where animals graze.
- Livestock production in Afghanistan largely depends on grazing, but only about 40% of the area is suitable for grazing during winter. Dried forms of forage include hay and other plant materials

What are grass and legume forages?

- Dried forms of forage include hay and other plant materials.
- *Hay* is green plant material that has been cut and dried for use as livestock feed.
- Ensiled plant materials refer to silage and haylage. *Silage* is chopped plant material that has been fermented.

What are grass and legume forages?

- Ensiled plant materials refer to silage and haylage. *Silage* is chopped plant material that has been fermented.
- *Haylage* is silage that contains less than 50 percent moisture.
- Both silage and haylage are more nutritional than hay because they are not dried.

What are grass and legume forages?

- A. Pastures are made up mostly of grasses and legumes.
- Pastures are often fenced in to reduce the intrusion of native plants.
 - Areas of land covered with both forage plants and native plants are considered a range.
 - A *range* is a large open area of land.
 - Pastures may be permanent or temporary.

What are grass and legume forages?

B. Permanent pastures are usually planted with perennial grasses and legumes.

- A *perennial* is a plant with a life cycle of more than two years.

C. Temporary pastures are usually planted with annual grasses and legumes.

- An *annual* is a plant that completes its life cycle in one growing season.

What are grass and legume forages?

- D. Hay can be made from a number of grasses and legumes.
- The cutting and drying of hay is important in maintaining the hay's nutrients.



Natural herbage drying, spread out and then heaped ready for transport to the homestead (Mehterlam, Afghanistan)

What are grass and legume forages?

- Hay that has been rained on is of lower quality; excessive moisture can also cause the hay to rot.
- Handling hay can be made easier by baling the hay in square or round bales depending on the equipment available and the needs of the producer.

What are grass and legume forages?

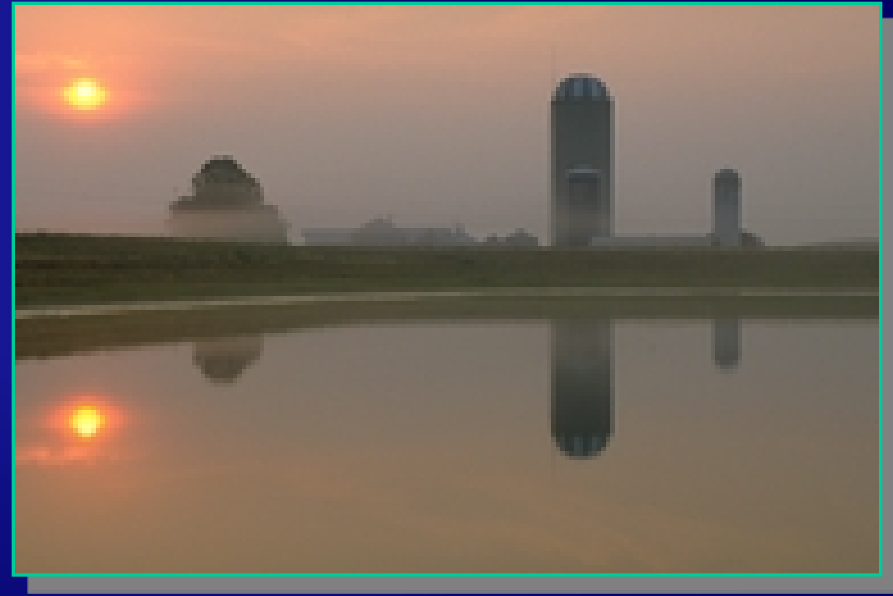
- E. Silage contains most of the above ground plant parts including the leaves, stems, and heads.
- Most silage is made from green crops such as corn and grass



This is what silage can look like

What are grass and legume forages?

- Silage usually contains 60 to 70 percent moisture; the high moisture level leads to fermentation during storage.
- Fermentation produces acids that prevent spoilage of the silage. Silage is stored in silos.



What are grass and legume forages?

- F. *Silos* are upright or horizontal facilities that maintain the quality of the silage.
- G. Haylage is silage that contains less than 50 percent moisture.
- Its production is similar to that of silage except that it is harvested later than silage and less moisture is added.



COMMON TERMS USED IN GROWING FORAGE CROPS

Forage—vegetation fed to livestock.

Pasture—improved or unimproved plant materials on land where animals graze.

Range—large open areas of land.

Hay—green plant material that has been cut and dried for use as livestock feed.

Silage—chopped plant material that has fermented.

TERM DEFINITIONS

Silo—an upright or horizontal facility that maintains the quality of the silage.

Haylage—silage that contains less than 50 percent moisture.

Grass—a plant that typically has leaves with parallel veins and stems that are hollow or solid.

Forb—a flowering, broad-leaved plant that has a soft stem; legumes used as forage plants.

Objective 2

Define grass and identify parts of the grass plant.

What is grass and what are the parts of the grass plant?

- II. A *grass* is a plant that typically has leaves with parallel veins and stems that are hollow or solid.
- Grasses normally have herbaceous stems, except bamboo which has woody stems.



What is grass and what are the parts of the grass plant?

- Height, color, life cycle, and seasonal preferences vary with the variety of the grass.
- Grasses are members of the *Gramineae* family.

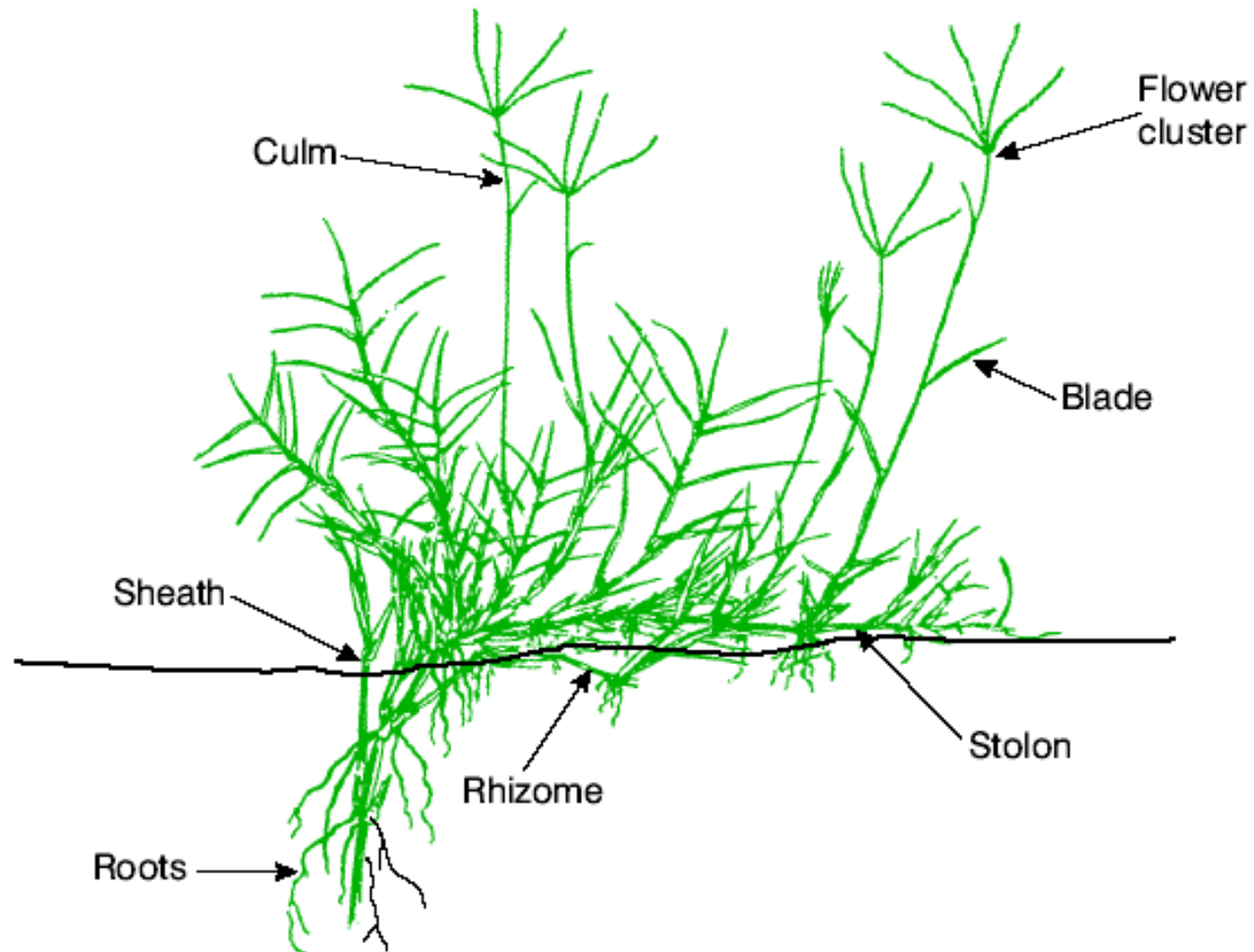
What is grass and what are the parts of the grass plant?

- A. Grass plants are made up of roots, culms, blades, flowers, and fruit or seeds.
- *Culms* are the stems of the grass plant. *Blades* are the leaves of the grass plant.
 - Grass plants have fibrous root systems that grow shallow into the soil.

What is grass and what are the parts of the grass plant?

- Many grass plants reproduce using stolons or rhizomes.
- A *stolon* is an aboveground creeping stem.
- A *rhizome* is an underground structure that sends up shoots.

MAJOR PARTS OF A BERMUDAGRASS PLANT



Objective 3

Explain how grasses
grow.

How do grasses grow?

III. Grasses grow both horizontally and vertically in a variety of ways.

- Horizontal growth includes bunching and sodding.
- Vertical growth includes short and tall grasses.



How do grasses grow?

- Grasses have fibrous root systems and are either annuals or perennials.
- Perennial grasses go through three phases of growth.

How do grasses grow?

A. During horizontal growth, some grasses bunch while others sod.

- Bunching plants often grow in circular patterns. Sod grasses are more aggressive than bunching grasses.
- Sod grasses use both stolons and rhizomes to reproduce and form a thick mat of stems, leaves, and roots.

How do grasses grow?

- B. Short growing grasses are more tolerant of grazing than taller grasses.
 - Height varies with the variety of the grass.
- C. Grasses have shallow, fibrous root systems.
 - These roots store little or no food and do not grow into the moistest layers of the soil.

How do grasses grow?

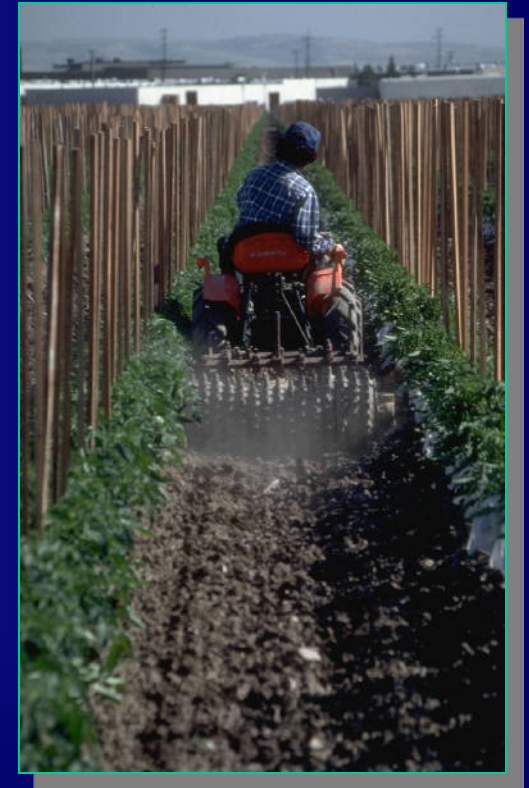
- Annual grass plants are planted each year and are commonly used in temporary pastures.
- However, most grass is established for long-term use, therefore, perennial grasses are used because they grow back each year.
- Perennial grasses go through three phases including tillering, jointing, and heading.

How do grasses grow?

- D. *Tillering* is the growth of buds from dormant shoots. These buds are known as tiller buds.
- This is the first growth of the year.
- E. *Jointing* is the growth phase in which the internodes begin to elongate.
- Vertical growth is rapid during this stage.
 - This is not a good time to cut forages.
 - The *boot stage* is the end of stem elongation.

How do grasses grow?

- F. *Heading* is the phase in which seed heads form on the plant.
- During this phase, shoots begin to grow from the base of the plant.
 - This is a good time to cut forage grasses because they have basal buds ready to repeat the growth process.



Objective 4

Describe how grass forages
are established and
maintained.

How are grass forages established and maintained?

- The forage grass established should be chosen based on its use and the climate in which it is to be grown.
- Forage grasses can be established using a number of methods.
- Seeding, sprigging, and specialized methods can be used in establishing forage grasses.
- Forage grasses can be used to reduce erosion.

How are grass forages established and maintained?

- A. Forage grasses can be planted into existing vegetation.
- This method of establishment causes minimal soil disturbance.
 - Preparing a seedbed, which would include disking or plowing, is often done for crops to be used as hay or silage.



How are grass forages established and maintained?

- B. Permanent pastures require yearly maintenance. Nitrogen fertilizers are often needed for forage grasses. Pesticide use, mowing, and irrigation may also be required.

Objective 5

Define legume and explain
how legumes grow.

What are legumes and how do they grow?

- V. Legumes are plants that fix nitrogen from the air in the soil.
 - Legumes used as forage plants are known as forbs.
 - A *forb* is a flowering, broad-leaf plant that has a soft stem.

Objective 6

Describe how legume forages are established and maintained.

How are legume forages established and maintained?

VI. The first step in establishing forage legumes is the choice of legume.

- The legume chosen should be well adapted to the climate and should meet the needs of the consumer.
- Like forage grasses, forage legumes can be grown in both prepared and existing seedbeds. However, it is important that the soil contain rhizobia bacteria so that nitrogen fixation can occur

How are legume forages established and maintained?

- A. Maintaining forage legumes is also similar to maintaining forage grasses.
- Maintenance is determined by the needs of the specific field.
 - Pesticide application, grazing, and mowing may all be used as maintenance activities.

Objective 7

Explain how hay is made.

How is hay made?

VII. Hay is an economical source of nutrients in livestock feed.

- *Hay making* involves the cutting, curing, and storing of high-quality, nutritious feed.
- Hay that is green, fine stemmed, free of weeds, and cut before it reaches full maturity makes the best quality hay.

How is hay made?

- A. Most forage grasses and forage legumes can be used to make hay.
- Cereal grains are also used to make hay.
 - Hay can be a mixture of legumes and grasses or may be pure.

How is hay made?

B. Hay should be cut at the growth or bloom stage of the plant.

- Cutting at this time will ensure the highest quality hay.
- Some plants may produce many hay cuttings per growing season.

How is hay made?

- C. Haymaking is almost entirely manual; mowing is generally by sickle, although the scythe is known.
- The common traditional sickle is smooth-bladed with a relatively straight blade set on a long metal neck attached to a wooden handle; the handle may have a slight hook at its extremity; the sickle is wielded with a scythe-like motion but using only one hand.

How is hay made?

- D. Hay from cultivated forage is nearly all lucerne and shaftal.
- They are both excellent hay crops, but the greatest problem in making hay in the hot and dry summers is avoiding leaf-loss through shattering.
 - Traditional systems take this into account. The crop is mown and left to wilt in the swath until limp, and it is removed from the field and dried elsewhere before there is danger of leaf-loss.

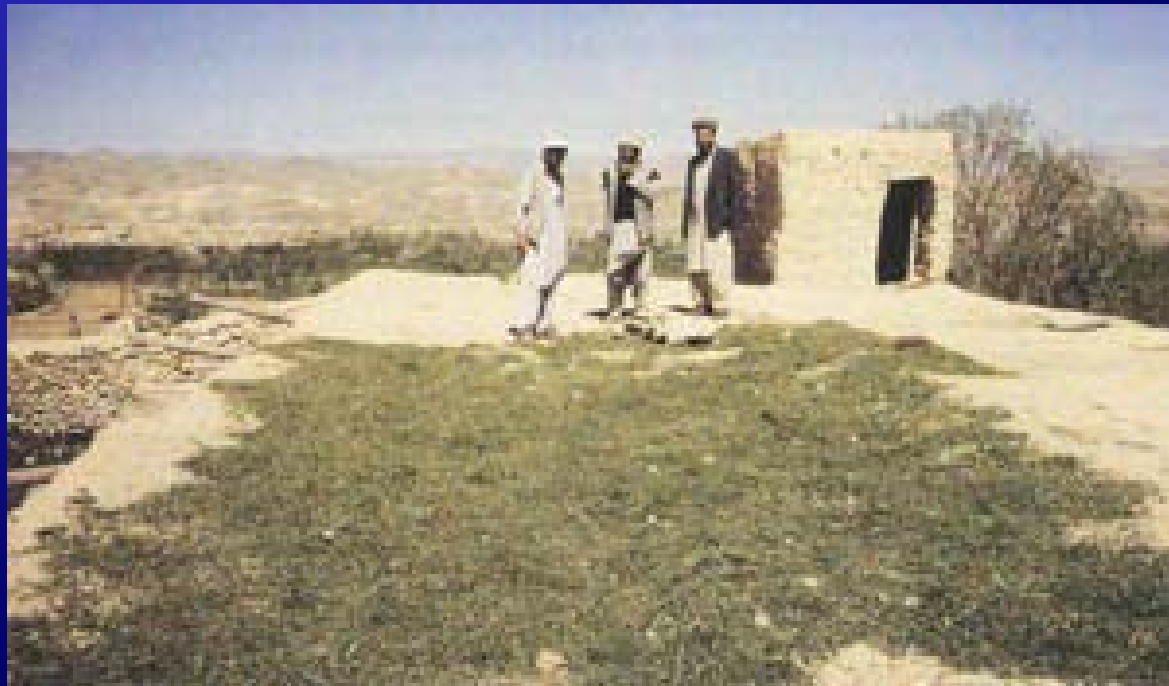
How is hay made?

- E. The wilted herbage may be tied into small trusses which are set on the bunds to dry; this also frees the field and allows re-growth with a minimum of shading from cut herbage and traffic during other haymaking operations.
- The trusses are turned periodically and, when they are judged sufficiently dry, are stacked loosely for further field drying, before final transport and storage.

How is hay made?

- F. Excellent hay is produced in this way and the leaves are kept within the trusses.
- After wilting, the forage may be carried to the homestead and dried out of reach of livestock, often on the roof. Any fallen leaves will be swept up and saved.
 - Shaftal is sometimes made into long, rope-like trusses, which are hung over the sunny sides of houses for initial drying and then finished on the roof. Hay storage is often under cover.

Shaftal drying on a roof (Ghazni, Afghanistan)



Objective 8

Explain the hay and fodder crops of Afghanistan?

Hay and Fodder Crops of Afghanistan

VIII. The most important fodder crops are

- ❖ **Lucerne** (*Medicago sativa*)
- ❖ **Shaftal** (*Trifolium resupinatum*)
- ❖ In the hotter areas of eastern Afghanistan, **Berseem** (*Trifolium alexandrinum*).

Hay and Fodder Crops of Afghanistan

- All three fodder crops are mainly fed to large ruminants. Berseem is given fresh, and lucerne and shaftal both fresh and as hay. Lucerne is also sold to other farmers, both fresh and as hay. It is grown as a perennial, but length of utilization varies between areas, from 2 to 7-8 years.

Hay and Fodder Crops of Afghanistan

- Shaftal is planted as a second crop and mainly harvested in late spring.
- For Ghazni province, hay yields from four cuts of lucerne were reported as 7-9 t/ha and from shaftal as 2.5-3.5 t/ha.
- More details of each types explained in the following slides

Hay and Fodder Crops of Afghanistan

- A. Lucerne (*Medicago sativa*) (*rishka*) is the most widespread and popular fodder and is cultivated from the lowest and hottest to the highest and coolest zones in all provinces of the country. Local ecotypes are used.



Lucerne

1. Nearly all the crop is irrigated, so one of the criteria when choosing between lucerne and clover as a fodder is always the availability of water throughout the entire growing season - much of the irrigation is seasonal.
2. The crop is often sown under wheat, and very high seed rates of up to 60 kg/ha are used. Seed quality is often mediocre; farm-grown seed or seed exchanged with neighbors is usual.

Lucerne

3. In areas of specialized cultivation, close to big towns where lucerne is sold as a cash crop, it may be direct sown or sown with a temporary nurse crop for shade, especially in the hot season; millet (*Panicum miliaceum*) is sometimes used as a summer nurse crop near Kandahar.
 - Spring sowing is as successful as autumn, but, since most is sown with wheat, broadcast autumn sowing is general.

Lucerne

- The crop is established with the intention of its lasting for many years - ten is often claimed - and local ecotypes certainly persist well, although their best performance is in the first five years.
- The number of cuts depends on the local climate; in low-altitude areas, six to eight cuts are possible where water is adequate; in the high areas, over 2 000 m, three cuts are usual.

Hay and Fodder Crops of Afghanistan

- B. Shaftal or Persian clover (*Trifolium resupinatum*) is the second of Afghanistan's major fodders.
- It is used in rotations and also in situations where perennial irrigation is not available for lucerne.

Shaftal, with trusses drying on a bund
(Herat Afghanistan)



Shaftal

1. In warm zones with two-season cropping, e.g., Khost, it is preferred to lucerne since the shaftal is harvested in time for summer crops to be sown; it is sown September-October and harvest is over in May.
 - In high altitude areas, where the clover is dormant under snow for months, harvest does not begin until May, and three cuts are taken up to August - the last cut may be harvested for seed.

Shaftal

- In all areas, it is autumn-sown for spring and summer use. In the higher, cooler areas it may also be grown as a summer catch crop after winter cereals; in some places, shaftal is sown in standing wheat at the time of the last irrigation

Shaftal

2. Two hay cuts and a seed cut are frequently taken from autumn-sown crops. A precocious cut of very young leaves may also be made for drying as a table vegetable. Shaftal is successfully made into hay.
3. Most of the shaftal sown in its traditional areas is from locally-grown seed that has had little or no quality control, and in some places farmers use very high seed rates.

Hay and Fodder Crops of Afghanistan

- C. Egyptian clover or berseem (*Trifolium alexandrinum*) is a crop of recent introduction, via Pakistan.
1. It is grown in some of the lower areas, such as Khost and Ningarhar, where the winters are sufficiently mild; it only withstands light frost.

Training on farmers' fields - a good crop of berseem



Berseem

2. Cultivation methods are similar to those for shaftal, but it is usually sown directly in early September, possibly mixed with some mustard.
 - If sown early, berseem, unlike shaftal, has rapid early growth and one or more cuts can be taken before growth stops temporarily due to cold weather.
 - A further four or five cuts can be taken in spring.

Berseem

3. It is, in suitable climates, more productive than shaftal and produces in autumn and early winter as well as during the spring peak.
4. It is not as popular as shaftal and is mainly used as green feed, and is not nearly as easy to make into hay as lucerne or shaftal. It is not suitable for use as a table vegetable.

Hay and Fodder Crops of Afghanistan

- D. Other fodders, such as vetches (*Vicia* spp.), are widely grown, often as a summer catch crop, but their volume is nowhere near as important as that of lucerne and clover.
- Chickling vetch (*Lathyrus sativus*) is cultivated in the very high altitude areas as both a fodder and a pulse.
 - No fodder grasses are cultivated, although maize thinnings are used in all areas where the crop is grown, and green wheat may be cut as fodder in times of scarcity.

Review / Summary

- *Forage* is vegetation fed to livestock.
- Forages are crops that are efficiently used by ruminant animals.
- A *grass* is a plant that typically has leaves with parallel veins and stems that are hollow or solid.
- Grasses grow both horizontally and vertically in a variety of ways.
- Horizontal growth includes bunching and sodding.

Review / Summary

- The forage grass established should be chosen based on its use and the climate in which it is to be grown.
- Forage grasses can be established using a number of methods.
- Legumes are plants that fix nitrogen from the air in the soil.
- The first step in establishing forage legumes is the choice of legume.
- *Hay making* involves the cutting, curing, and storing of high-quality, nutritious feed.