**THE FEDERAL UNIVERSITY, KASHERE**

**FACULTY OF AGRICULTURE**

**DEPARTMENT OF ANIMAL SCIENCE**

ANS: 5208

Course Code: ANS 5208

Course Title: Pasture and Range management

No of unit: Two

Course Duration: Two hours

Status Compulsory

Prerequisite: Nil

Course instructor: M.S.Sadiq and I U Bello

Department of Animal science

Phone: 08036954296

Email:msskumo@gmail.com

**Course description**

This course is very important for profitable animal production. This stems from the fact that a

Good understanding and judicious use of knowledge acquired from this course would lead to

Huge reduction in the cost of intensive livestock production.

**GRADING SYSTEM FOR THE COURSE**

This course will be graded as follows:

Class Attendance In form of random quizzes 5%

Assignments 5%

Test(s) 20%

Final Examination 70%

**TOTAL 100%**

***Attendance:*** It is expected that every student will be in class for lectures and also participate in all practical exercises. Attendance records will be in the form of random quizzes to determine each person’s qualification to sit for the final examination. In case of illness or other unavoidable cause of absence, the student must communicate as soon as possible with the instructors, indicating the reason for the absence.

***Academic Integrity:*** Violations of academic integrity, including dishonesty in assignments, Examinations or other academic performances are prohibited. You are not allowed to make Copies of another person’s work and submit it as your own; that is plagiarism. All cases of Academic dishonesty will be reported to the University Management for appropriate sanctions in Accordance with the guidelines for handling students’ misconduct as spelt out in the Students’ Handbook.

***Assignments and Group Work:*** Students are expected to submit assignments as scheduled. Failure to submit an assignment by certain student as at when due will earn such student zero for that assignment. Only under extenuating circumstances, for which a student has notified the instructor in advance, will late submission of assignments be permitted.

***Code of Conduct in Lecture Rooms:*** Students should turn off their cell phones during lectures. Students are prohibited from engaging in other activities (such as texting, watching videos, *etc*.) during lectures.

**Introduction**

Livestock production in Nigeria is still dominated by extensive production system. Under the extension production system; land areas for grazing and feed availability are severe limiting factors in the high livestock producing zone of Nigeria. There is need to increase fodder production to accommodate the feed requirements of Nigeria’s livestock. Increments in fodder production can be achieved by expansion of land areas under natural pastures or by increasing forage production yields per unit area.

**Pasture:** is a piece of land on which herbage (grasses, legumes) crops are naturally found or deliberately grown for feeding livestock, it is either grass or legume or combination of grass and legume.

**Forage:** are plants that are cultivated for their vegetative portions and used in fresh or preserved forms for feeding livestock. Forage may therefore be growing grass, legume, shrubs, hay and silage.

**Fodder:** Is any coarsely chopped grass or legume in dry or fresh form that is cut, carried and fed to farm animals usually cattle, sheep, goats, pigs, camels, donkey and horse etc.

**There are two types of pasture as follows:-**

1. **Natural Pasture:** Which is generally referred to as piece of land, which grows without the interference of man or which was not consciously planted by man.
2. **Artificial Pasture:** Which is the reverse of natural pasture is referred to as sown pasture or cultivated pasture it also subdivided into two.

a. **Pure Pasture:** Is the types of pasture in which only one species of grass is grown.

b. **Mixed Pasture:** It is a piece of land containing legumes and grasses of more than one type of species in the same land, it can be permanents or temporary, where the permanent are pasture that are cultivated for many years e.g. up to ten years or more while the temporary are cultivated for 3-5years, these types of pasture mentioned above are suitable enough provided that good management are put in place.

**Grasses and Legumes**

**Grasses:** Grass is term used to describe all members of grass family ***poacea,*** grasses areMonocotyledon in which the embryo at grass seed has a single cotyledon or leaf, the grass plants consist of basic simple design which involve the following:

1. The root that gives rise to cylindrical jointed.
2. Leaf blade which are born on sheath which arise at the nodes and encycle the stem.
3. Inflorescence which consist of many several flowers from which seed are developed.
4. Grasses are annual, biennial or perennial depending on the species classes.

**Types of growth habit in grass:**

1. Tufted type, bunch type or tussock (all three are the same) this is a cluster clump, or hummock of vegetative shoots or culms arising from a single crown e.g *Pannicum maxium,* the culm of a tufted grass may grow erect, in a **decumbent passion** i.e curving upward from a horizontal base, semi erect or semi decumbent passion. The stems may also lies flat on the ground for some length and then turn upward; in this case they are called **procumbent or prostrate passion**.
2. **Creeping**: The culms trail over or underneath the ground surface e.g C*ynodon spp*.
3. **Scrambling or Climbing:** These the pits on normally creepers, but the culm will grow upward and cover upright object e.g *Pennesetum clindestanum.* They require staking condition.

**The Legumes**

Legumes as opposes to grasses are **dicotolylendenous** i.e the embryo consist of two cotyledons or seed leaves, the legumes sometime divide into 1 to 3 group of subfamily.

1. *Mimosaceae 2.Ceasalpinaceae 3.Papilionaceae*

***Mimosaceae*:** These are woody plants adhere with regular flower.

***Ceasalpinaceae*:** These are legumes with irregular flower.

**Papilionaceae:** Are herbaceous and woody plant with distinct papilionate or butterfly shaped most of the forage are economically important. legumes may be annual,biennial,perrenial

**Characteristic of Legumes**

1. They are associated with rhizobian bacteria inform of symbiotic relationship.

2. Pods becoming crops and generally called legumes including trees crop such as cocoa, *acacia albida, piliostigma reticulum.*

**Types of Growth habit in legumes**

1**. Bush** **type**: - The central stalk with side branches appear along the main stem with on auxiliary branches like cajan-cajan.

2. **Bunch type:** A simple crown from which several stems and new tillers arised, making it different to identify main stem. Stem may be erect or recumbent e.g *Medicago sativa* or S*tylonsanthes voyannace*.

3. **Creeping Stem:** The stems trails over the ground surface e.g some *vigna spp.*

4. **Scrambling:**Many of the creeping plant climb onto and grow over upright object some are also twining and encycle on upright e.g *Centrocema pubescene.*

**Principle Governing the Choice of Species:**

1. **Suitability of the environment:** within limit of any primary range, the most important factor is rainfall, therefore introduced or local varieties which are perform under similar condition.
2. **Utilization:** This is determine by whether the pasture is going to be cut or graze e.g Guinea grass, if the pasture is to graze insitu the grasses like Carpet grass that are resistant to trampling is more adapted to grazing than elephant grass, therefore if the pasture is planned for grazing, choice should turn down guinea grass.
3. **Type of grazing animal to be used:** the feeding habit of animal will determine the type of plant to be selected for instance goats are obligate browser than to graze therefore inclusion of browse plant into the pasture is essential.
4. **Perenniality of the crops:** perennial should form the basis the pasture, however short term legumes are desirable in long term pasture. Some of the short term legume has been included in pasture where perennial legume are established, the long term legume are low starter therefore the short term legumes can give higher yields in the first year as can help in controlling weeds.
5. **Yields:** Established pasture with higher yield by selecting species which are known to be higher yielding under your own local condition, high yielding ability of crops can be manipulated by fertilizer, plant cutting and inclusion of legumes.
6. **Compatibility:** (mixed or compound pasture) these concern the grass and legumes. The legume tends to improve the nitrogen content for grasses and decrease the need of fertilizer application.
7. **Resistant to pest and disease:** This is very important especially under humid condition; the crops or spps selected should tend to resist local disease and pest.
8. **Palatability and nutritive value:** these can be manipulated by cutting stage and fertilizer application.
9. **Variation in soil fertility:** The best species are those which produce best dry matter yield under variable soil condition.

**Browses:** browses are leaves and twigs growing on shrubs, woody vine and trees for animal consumption. Most of them are ever green plants that have well defined root and shoot systems, the root system may vary depending on species. The shoot includes stems, branch stems, leaves, node internodes, flowers, fruits and seeds. The morphology of browse is similar to that of woody legumes.

**Example of browse plants**

*Acacia albida,Gliricidia sepium,leucaena leucocephala*

**Pasture Establishment**

1. **Land preparation:** The most successful pasture establishment method is to clear the land and prepare seed bed, land preparation involves clearing, pulverizing the soil and cultivation. During the clearing, trees, shrubs and sapling are pulled down and windrowed. Roots and stem is then cut.
2. **Ploughing:** Ploughing should be done when rains have established. The area ploughed is there after disk harrowed when it is ready for planting. In some cases it is usually necessary to plough and harrow only once but single ploughing and double harrowing gives better prepared land. The smaller the seed to be planted the finer the land preparation required ensuring good germination.
3. **Sowing method and depth:** Three sowing method are conveniently used for pasture establishment, broadcasting, drilling and sowing/transplanting on hill depending on the forage materials, size of the land area and resources of the farmer.

**Broadcasting**: Is employed when a seed drill is not available or when the ground is too soft to allow the machinery. In this condition higher seed rates should be used when seeds are broadcasts, light harrowing using trees branches will result better establishment. In order to obtain even distribution, seed may be mixed with dry sand or super phosphate fertilizer in a proportion of one part by volume of dry seed to three parts by volume of sand/fertilizer.

**Drilling /Sowing**: Pasture seeds, can be sown with a combined seed and fertilizer drill. This has the benefit of placing the seed and fertilizer at different depths. The depth of the sowing should be (1-2cm) in the absence of the above equipment, an ordinary drill calibrated to suit the size of the seed being planted may be used. In this case seed and fertilizer are mixed. Pasture seed for sowing should be 3-4 stand/ hill, established using 30cm intra-row and 75cm inter row spacing or 50cm spacing for both inter and intra row this ensure early ground cover and high fodder production.

**Vegetative**: Pasture grasses which established vegetative from cuttings or broken stocks e.g (*Cynodon spp, Pennesitum purpureum* etc) should carry a minimum of three nodes which stems each carrying petiole, leaf blade and viable buds. Vegetative material to be transported over considerable distance for transplanting are usually uprooted a day or two ahead of planting. The leaves and stems from the shoot of material should be trimmed to reduce water loss.

**Seed rate**: The seed rate of most the adopted grasses and legumes depend on method of sowing, land preparation, however, higher seed rates may be used where the seed are not properly cleaned and low germination percentage are suspected. Where broadcasting is used or where seed bed preparations poor

**Method of seed treatment:** seed treatment is done to break the dormancy of some seeds with hard seed coats which will not geminate under normal condition. such seeds have protective mechanism that help them to survive adverse weather condition. The seeds have tough seed coats impermeable to water and resist high temperature. These seeds are called hard seeds. The hard seeds need to be treated before germination. This can be achieved through the fallowing.

**Fertilizer application:** Pasture grass species respond positively to nitrogen application depending on soil fertility. Nitrogen increases the yield of forage by 50-60%. The application of fertilizer ensure successful pasture establishment. Nutrient deficiency in the land should be corrected by use of fertilizer (inorganic) and manure. This is essential to ensure the successful establishment of pasture species on the soils with low fertility or depleted of nutrients due intensive cropping. Nitrogen (N) phosphorus (P), Potassium (K) or compound fertilizers (NPK) are necessary for grasses; (P) should be applied for legumes in the savannah zones of Nigeria. High forage yield have been obtained with the application of 100 to 150kg N/ha and 20 to 30kg P/ha for grasses and 18-30kg K/ha for legumes.

**Weed control:** In Nigeria we do not encourage the use of herbicides in pastures to control weeds. However, for pasture species established in a specified spacing, tractor drawn rotary weeders, ox drawn cultivators, manual weeding with hoes and the roqueing off types could be used to control weeds. It is recommended that the newly established pasture be weeded twice at one month and at 2-3 month after seeding.

**Management of newly established pasture:** The newly established pasture must be protected from grazing during year of establishment light grazing or mowing can be allowed during the second growing season up to the end of mid vegetable growth stage. Thereafter the fieln should be closed for herbage accumulation. Grasses should generally not be grazed until the plants have flowered, where the stands are poor, seed must be allowed to ripen and drop before grazing in order to encourage re-seeding and increase ground cover, on other hand, where the established pasture has good vegetative cover, the pasture could be lightly grazed before flowering, in grass legumes mixture, grass is usually vigorous than the legume. The legume can be established first to be followed by the grass three week later.

**Disease and pest control:** Various pest and diseases do occur in pasture production. The legumes are more susceptible to disease and pest than the grasses. Use of forage species which are resistant or tolerant to major pest and diseases is encouraged.

Assignment writes on pasture seed production techniques.

**Utilization and maintenance in pasture:**

The target is to have efficiency in feed utilization, it is continue decision that need to be made, when you control the grazing properly the pasture species will remain, but when you overgrazed, the root of the pasture will be affected and the sward will die, therefore utilization of pasture is best on the type of grazing system. There are different types of grazing system: grazing management deals with such questions as how long animals should stay on one area and how long they should stay off it, which animal should graze what pasture; how many animal graze together, grazing management and stocking rate are the two most important management variable effecting herbage production, seasonal pattern of production, herbage quality and botanical composition. Stocking rate is defined as a number of animals grazing a unit area at particular time. In selecting a system of grazing, a farmer must consider the effect of the grazing method on the output per animal and the effect of the grazing animal on the pasture. The best is that which meet the requirement of livestock in term of daily supply of feed throughout the year while maintaining the pasture.

**Two grazing management systems are common**

Continuous grazing and some form of Rotational grazing system.

1. **Continuous grazing:** it involves the management where by grazing animals are confined within a simple enclosed pasture area for the entire growing season that may be full year this type of system lead to under grazing in wet season and overgrazing in dry season.
2. **Rotational grazing:** This system requires the sub-division of the pasture into a number of enclosures (fences) with at least one more enclosure more than the groups of the animals. It is an intensive system practiced on improved pastures. Animal are moved systematically from one to another fence (paddock) in rotation, the time to graze in each paddock varies from 4to7days and take 8 week before re-grazing.
3. **Deferred grazing:** The system recognises the critical period in the phonology of the desirable plants in the pastures such as seed germination and seedling establishment, flowering, seed set and period of storing food in the root and crown regions of the plants. This method allows each enclosure to be free of grazing during the critical period or for longer period within the grazing year.
4. **Strip grazing:** This is similar to the rotational grazing, but temporary fence are put to confine the animal in specific rotation. Dairy animals are commonly strip grazed on highly productive pasture in order to rotate the amount of forage needed by the animal for part of the day.
5. **Zero grazing:** It is also known as soiling, cut and carry, or mechanical grazing stems. It entails cutting the herbage and feeding to animal in pens.

**Some general grazing management practices**

* **Paddocks:** Partitions of grazing areas will aid in more efficient utilization of pasture the smaller the paddock the greater the efficiency. under natural condition paddocks may be in the region of 80-150 hectare in size. While for sown pastures paddock size can be as small as two hectares.
* **Fencing:** The site must be fenced to keep away strange animals so that the producer can reap the benefits of his investment and effort.
* **Types of stock (Animals):** High producing stock such as dairy, beef fattener and breeding herds requires best quality herbage that is available on the farm.
* **Frequency of paddock grazing:** A rapid rotational grazing is recommended for high producing stock on improved pasture e.g. 3to7 days grazing and 2-4weeks period in this way they can obtain a high quality diet.
* **Shades:** These should be provide in the paddock when clearing land for pasture, care must be taken to leave some trees along the fence or in clusters as shades for animals.

**Factors to consider choosing grazing system**

1. Condition of the range
2. Amount of rainfall and its distribution
3. Length of dry season
4. Vegetative cover and length of the growing season
5. Objective of the livestock enterprises
6. The land tenure system
7. Type of livestock and quality of product
8. Management skill of the range man

**Range management**

Range and Rangelands are term that use for related to land areas covers with natural and semi-natural vegetative that form a suitable habitat for extensive grazing for both domestic and wild animals. They include various types of grassland, woody bush ,shrubs and savannah use for grazing cattle, sheep, goat, donkey and camels. The grazing areas may be restricted by fencing or open range to all cattle, keepers. Stoddert (et al 1975) Defined rangeland as these areas of the world which reason of physical limitation (low or erratic rainfall), rough topography, poor drainage or cold temperature) are un-suited to cultivation and which are a source of forage to native and domestic animal as well as a source of wood product, water and wild life.

**Range management:** Is defined as the manipulation and utilization of Rangeland resources, soil vegetation, animal for the production of goods and services to meet human needs. Therefore good planning and implementation of plan is basic pre-requiresite of utilization optimum yield from herbage and animal production in relation to conservation of rangeland resources.

**Principles of range management:** The principle that governs the management of rangeland can be classified into two groups.

1. Principles related to the animals reared on the range.
2. Principles related to the herbage or vegetation .In any case the application of the principles is govern by the factors of the environment such as climate existing in the rangeland, therefore the application of the principle differ between ranges.

**Principle related to animals**

1. **Grazing intensity:** These are the number of animal per hectare without damage (stocking rate), it determines the degree of usage weather over used or under used, either of the two are not require.
2. **Control over kinds of animals using the range:** Different animal have different feeding habit and therefore influence the vegetation of the range.
3. **Animal distribution over the range for proper herbage utilization:** Too many animals in one area of the range leads of overgrazing, soil erosion, proliferation of unwanted plant species.

**Principles relation to vegetation**:

1. Elimination of undesirable plant species by proper grazing management and bush control particularly use of fire.
2. Seeding range land with improved forage spps (grass, and legumes) to argument the existing natural vegetation.
3. Fertilizing and or laming the range lands so as to correct soil nutrient deficiencies.
4. Soil conservation practices aimed at controlling water and soil erosion

**Causes of rangeland degradation**

1. Climate changes
2. Overgrazing
3. Uncontrolled fire
4. Cultivation
5. Communal grazing
6. Socio-economic factor
7. Rodents and predators
8. Soil erosion
9. **Climate changes:** drought (lack of rainfall over a period of time, for instance, the drought condition occurred in 1973, plants species become desiccated , dries up and dies off. e.g *ficus spp* was extinct but now a days it is regenerating.
10. **Overgrazing:** If the rangeland can take ten animal per hectare, do not extend or reduce the exact animal number, because it leads to overgrazing with result to erosion and the land become bear.
11. **Un-controlled:** Fire is a good servant out of bad master fire can be use in good way to eliminate undesired plant which contains toxics substance and became harmful to animals.
12. **Cultivation:** This also lead to the degradation of rangeland e.g in semiarid and areas, arable crop land and rangeland can’t be differentiated because the same land are used for both grass and legume production (rangeland) and in the overtime, it is cultivated for arable cropping activities.
13. **Communal grazing:** Causes a considerable over utilization of the land and the land is exposed to sheet erosion which lead to rill and up to gully erosion.
14. **Socio-economic factor:** Such as poverty, illiteracy and these factors lead the farmers to cut-off the trees to fed their animal their by degenerating the rangeland resources.

**Classification of range condition**

To obtain the maximum utilization of the range resources and assessments of the herbage production and species composition of the current year, season, or months or compared to the any production established by previous records, four classes are used to classifying the condition of the range.

1. **Excellent condition**: In this case the vegetative cover is normal with productive vigorous plants, no erosion and with large amount of **decreaser spp** (plant that highly needed by animals refers to as cake plants. **Increaser** spp they are not accepted to the animals compared to decreaser when decreaser decreases they become increaser to grazing animals. **Invaders** spp are those which animals are not relished at all referred to as weeds and with the decline in decreaser, increaser, the invaders comes in. Absence of invaders spp and vegetation produce 75 to 100% of the carrying capacity.
2. **Good range condition:** better herbage spp predominate but increasers are noticeable blown out areas may be visible and some soil erosion takes place and provide 50 to 75% of the carrying capacity.
3. **Fair range condition:** increaser spp are dominants, bush encroachments may be serious i.e trees and shrubs and soil erosion is prominent and provides 25 to 50% of carrying capacity.
4. **Poor condition:** very sparse and unstable vegetation cover, little mulch and heavy
5. erosion, severe encroachments, carrying capacity is 0 to 25%

**Forage Conservation**

The major challenge in animal production is ensuring supply adequate quality and quality of feed throughout the year. There are abundance supply of feed during rainy season and a shortage during late dry season, herbage availability during rainy season exceed animal requirement, the accumulated forages losses in must often cause nutritive value with adverse maturity. Losses could be due internal chemical change and due internal microbial changes and cut herbage is prevented either by dehydration or acidification. In Nigeria conservation of natural pasture surpasses handling practiced due to.

1. Inherent inefficiency in a feeding system
2. Low nutritive value of the product
3. Unfavourable weather conduct

But due to increase intensification or livestock Production it became necessary for fodder to be practiced as a mean of redistribution feed supply to make livestock requirement over the season. There have a problem of choice of species, good management and adequate fertilizer of some pasture, such practical enhanced herbage yield and increase chemical composition and enhance digestibility and increase quality or conserved product.

**Conservation Method suitable to our environment:**

* Conservation insitu (fogging)
* Standing hay
* Ensilage
* hay

1. **Conservation Insitu:** This consist of leaving excess herbage and browse plant as a standing vegetation in the grazing area: In this method herbage decrease in nutritive value, bleaching and decrease in leafiness, however conservation in situ is the cheapest form of conservation fodder and most widely used.
2. **Standing hay:** Legumes pasture after shady it seed it allow to remain as standing hay until the first rain of growing season.
3. **Hay:** Hay is the aerial part of forage crops, which harvested during growing period and preserved by drying for later use in animal feeding, hay quality can be described as forage dried so as dry to retain most it leaf without deterioration of dry matter and nutrients, without mould developed, having it natural green colour and capable of been stored over a period of time, a detail knowledge of the seasonal growth and development comprising chemical change in the forage are necessary to obtain maximum yield of digestible nutrient of the hay. The early flowering stage appear to be the more appropriate time for harvested grasses, for tall growing grasses such as maize, *Sorghum alum,* elephant grass, hay production should be at full bloom stage. However you should noted that weather condition, uneven land surface that permitted operation, lack of technical knowhow and scarcity of hay making equipment are all factors than can hinder hay production.

**Hay making procedure:**

1. Ensure there is continuous supply of sunshine
2. Condition and favourable for drying
3. Cut the forage materials allow to dry or allow it to dry into field and stalk it when dry.

**Hay making equipment**

1. Tractor or mower
2. Windrowers
3. Bale throwers
4. Automatic bale wagon
5. Cubing machine etc.

**Silage and Haylages:** These are fermented forages stored under an aerobic condition in a silo is regard as most succulent feed material produce under an aerobic condition since climatic condition make hay curing difficult, silage making offer a more reliable mean of forage conservation grasses are the most materials use for silage e.g. *Sorghum alum, Panicum, maximum, Pemisetum, purpure, Zea mays.*

The ensiling process (silage making): The ensiling process refers to the changes which take place when forage or feed with sufficient moisture to cause fermentations stored in a silo in the absence of air. The entire ensiling process requires 2-3weeks, during which time, the following aerobic (with air) and anaerobic (without air) activities predominate.

1. **Aerobic activity:** The living plant cell of the forage continues to respite consuming the oxygen of the silage-entrapped air, producing carbon dioxide and water, and releasing energy or heat. Simultaneously aerobic yeasts and mould thrive and multiply.
2. **Anaerobic activity:** When the available oxygen or trapped air has been consumed, anaerobic bacteria-chiefly acid forming and proteolytic multiply at a prodigious rate. Simultaneously, the mould and the yeast die, but continue in a minor way to function as enzymes when produce other ends products.

The combined anaerobic activity produces the following changes:

1. The carbohydrate and Sugar (especially sugar) are broken-down into lactic acid, acetic acid and a small amount of other acids as alcohols,
2. Small quantities of proteins are broken-down into ammonia, amino acids, amines and amides.
3. The acidity finally reaches a point where the bacterial themselves are killed, as the silage making process is complete.

**Precaution taken during the process of silage making**

1. Practical wilting prior to ensiling increase dry matter percentage and reduce bacteria activities.
2. Chopping of the forage to an average length of 4cm crushing steamy or course material assist compaction.
3. Consolidate creates an air-tight conduction which promotes fermented.
4. Addition of sodium chloride to improve fermentation and palatability of inferior silage.

**Properties of Good Silage**

**Physical Properties**

1. Present a pleasing test
2. The colour should be greenish yellow
3. Free from mould
4. Acceptable aroma

**Chemical Properties**

1. Good silage has a low concentrate of hydrogen ions (PH) 3.8- 4.5.
2. Little ammonia 5- 8%.
3. A shared lactic, acetic and butyric acid in the quantity of the acid produced should not exceed 8.5%, 2.5% and 1.5% respectively.

**Advantage of silage over hay**

1. Silage traps the high proportion nutrient in the forage compared with hay.
2. It produces maximum quantity of feed per hectare.
3. It is possible to produce high quality feed when whether condition as not favourable for hay making.
4. It requires less storage space per kilogram of dry matter than hay.
5. It is a very palatable feed.

**Advantage of hay over silage**

1. It is the best form of long-term storage of forage.
2. It is an excellent source of certain vitamin and mineral.
3. It is easy to handle as feed.

**Husklage:** Is silage feed consisting primary of husks and cobs with limited grain that remain in the field following grain harvest.

**Fodder bank:** Is fenced on densely planted forage legumes, providing high protein feed supplement during dry season.

**DRY SEASON FEEDING**