

AR- 7902
B.SC (Forestry) (Fourth semester)
Examination 2013
Rangeland Management
Paper: Fourth
Time allowed: Three hours
Maximum Marks : 60
Note: Answer any five questions. Question No.1 is compulsory

Q.1 (a) Define the following terms (2x5=10)

- i. **Retrogression** – It is a reversal process of succession. When natural succession is obstructed due to natural or biotic factor at any stage of succession and progression is altered and pushed back to several stages formed earlier. The factors responsible are natural e.g., drought, floods, insect pest erosion, landslides etc. and manmade e.g., clear felling, shifting cultivation, fire, logging, girdling etc.
- ii. **Forage preference** - Forage is plant material (mainly plant leaves and stems) eaten by grazing livestock. Forage preference refers to the preference of certain kinds of forages by different animals. It depends upon palatability, digestibility, availability, nutritive value of the material.
- iii. **Rotational grazing** - Rotational grazing “involves dividing the entire range into several pasture units or paddocks and then grazing each in sequence throughout the grazing period”. Utilizing rotational grazing can improve livestock distribution while incorporating rest period for new forage.
- iv. **Sclerophyll** - is a type of vegetation that has hard leaves and short internodes (the distance between leaves along the stem). The word comes from the Greek *sclero* (hard) and *phylon* (leaf). Sclerophyllous plants occur in many parts of the world. But are most typical in the chaparral biomes.
- v. **Prairies** - An extensive area of flat or rolling, predominantly treeless grassland, especially the large tract or plain of central North America. Prairies are considered part of the temperate grasslands, by ecologists, based on similar temperate climates, moderate rainfall, and grasses, herbs, and shrubs, rather than trees, as the dominant vegetation type.

Q.1 (b) Fill in the blanks (1x5=5)

- i. Annual grasses have life less than one year
- ii. Weeds are undesirable plants
- iii. Sedges have triangular stem
- iv. Corn is an example of monocot belongs to poaceae family
- v. Number of times plants are grazed during a grazing period is called grazing frequency/grazing intensity

Q.1 (c) State whether true or false (1x5=5)

- i) The character that reduce the probability of grazing are called grazing avoidance- True
- ii) Grassland is known as pampas in Argentina - True
- iii) Tundra means tree less mountain tract. – True
- iv) Sedges have solid and non jointed stem.- True
- v) Phragmites is found in marshy tract – True

Q2 Define range utilisation. What is the importance of range utilisation? Mention the methodology of range management.

Range utilisation refers to the percentage of current forage removed by grazing animals or the amount of residual. It is an important “tool” in range management. Utilization is one of several tools that can be used in an adaptive management decision process. Utilization guidelines are intended to indicate a level of use or desired stocking rate to be achieved over a period of years. Utilization can be an important factor in influencing changes in the soil, water, animal, and vegetation resources. It gives the idea about the quality of forage. It gives idea about overall consumption of forage.

Range Management is a distinct discipline founded on ecological principles and dealing with the use of rangelands and range resources for a variety of purposes. These purposes include use as watersheds, wildlife habitat, grazing by livestock, recreation, and aesthetics, as well as other associated uses. If rangeland is in good condition we have to maintain it and if not in good condition than we have to improve it. Range management can be done on the following basis

- 1. Topography:**
- i) . Sehima-Dichanthium Type: Undulating to valley. Management practises are soil and moisture conservation
 - ii) Dichanthium-Cenchrus-Lasiurus type: Levelled. Management practises are rotational grazing, stall feeding , reseeding.
 - iii) Temperate and alpine cover: These are spread across altitudes higher than 2100 Management practises are soil and moisture conservation, introduction of legumes nutritive species application of fertilisers.

2. Density- - Number of individuals per unit area.

Density	value	Grade
0.50	10	Excellent
0.30-0.34	6	Good
0.10-0.14	4	Fair
Less than 0.9	2	poor

3. Season of grazing- The time period during which grazing occur in a particular site over a period of year.

Grazing Systems -Grazing systems manipulate livestock use in a systematic and planned manner to achieve objectives through correct stocking, controlling season of use and prescribed rest period.

Q3. Write short notes on the following

(a) **Carrying capacity-** is defined as the maximum stocking rate possible which is consistent with maintaining or improving vegetation or related resources. It may vary from year to year on the same area due to fluctuating forage production.

$$\text{Carrying capacity} = \frac{\text{Total number of animals} \times \text{days of grazing}}{365 \times (\text{a= area of grazing})}$$

(b) **Range improvement-** Any activity or program on or relating to rangelands which is designed to improve production of forage, change vegetation composition,

Operations involved in range improvement

Re seeding- The objective of range seeding is usually to alter the composition of vegetation so that the productivity of the land, especially its livestock grazing capacity, will increase. Restoring the production potential of deteriorated rangeland is attractive to ranchers whose operations are not profitable. Sometimes the objective of seeding is to revegetate barren or abandoned croplands, revegetate land after a prescribed fire, create a better seasonal balance in the forage supply, improve the quality and quantity of forage, reestablish native plants, or establish ground cover to prevent soil erosion and water runoff

Introduction of grasses and legumes – Arid zone – *Cenchrus ciliaris*, *Dicanthiumm annulatum*

Black cotton soil- *Cenchrus ciliaris*, *Panicum antidolale*

Fertilization – Farm yard manure 20 tons per hectare

Nitrogen- 40 Kg per hectare

P₂ O₅-30 Kg per hectare

Soil and moisture conservation- Soil conservation is a set of management strategies for prevention of soil being eroded from the Earth's surface or becoming chemically altered by overuse, acidification, salinization or other chemical soil contamination

Sub soiling:

Soil is broken with a sub soiler into fine grains to increase their absorptive capacity.

Contour trenching:

Several 2 feet by one foot trenches are formed across the slopes at suitable intervals.

Gully control:

Suitable water conservation measures are to be taken so as to prevent the formation of gullies

Contour Furrowing

Contour furrows are grooves or ditches made in the soil by various implements (plows, Chisels, furrowers, etc.).

Water Spreading

Water spreading was developed in arid regions receiving limited rainfall that falls during short, intense storms resulting in runoff. Water spreading is a simple irrigation method whereby flood Waters are diverted from their natural course and spread over adjacent flood plains.

Ripping

Ripping on rangeland is synonymous with chiseling or subsoiling on farmland. It is done to fracture compacted soil layers to allow water and root penetration

Q4. Describe the origin, characteristics, status and management of Indian rangeland

The history of grasses and grasslands in the temperate belt of Asia begins with the Progressive uplift of the Himalaya which increased aridity in north-west India. The cyclic shifts in climate since the Pleistocene and the aridity and warmth of the Neothermal period permitted diversification and spread of grasses and herbaceous flora. Subsequent introduction of cattle,

fire and the widespread impact of humans over the last 5,000 years has reduced the forest cover and resulted in a spread of grass cover most of the grasses of western monsoon in Asia are of recent origin derived through immigration of ancestral species from other areas such as semi-arid Africa, the Mediterranean and continental Asia. Clearing and opening the forests for various land-use practices and frequent burning of steeper south facing slopes for the production of hay and intensive livestock grazing have converted a considerable area under herbaceous vegetation. Such areas include forested blanks in humid areas, mid-elevation hay fields, fallow lands and village grazing grounds. Such areas are frequently termed 'rangelands' or pastures.

India has a total geographical area of 326.82 m ha. The total utilizable area 301 m ha is further devoted to arable lands 51%, forests 16%, permanent pastures 4% and other grazing lands and uncultivable degraded lands constitutes an area of 29%. Thus, nearly 85 m ha is the area which supports India's huge livestock population. The grasslands and rangelands are extremely important in India as it has wide range of types of rangelands from alpine pastures in the high Himalayas through deserts in western and rain fed pastures in south India. In India more than 40% of the large population of livestock still depend upon grazing in the rangelands / pastures (on high altitudes), desert areas and rain fed farming systems on two third areas of the crop lands. Indian rangelands are basically classified in tropical and temperate grassland. Both of these category is having four major classes. The rangeland in India suffer from several problem These problem are (1) higher grazing than carrying capacity(2) adverse site factor (3) poor management (4)degraded condition (5) poor productivity (6) lack of stall feeding. The grassland in India are three type of ownership (1) Private(2) community(3) Government .Most of these grassland are ecologically sensitive and need to be improved by holistic management technique. Important steps for improving these land include (1) controlled grazing (2) soil and water conservation (3) introduction of species (4) controlling weeds (5) applying fertilisers (6) planting fodder trees.

Q5. Differentiate between

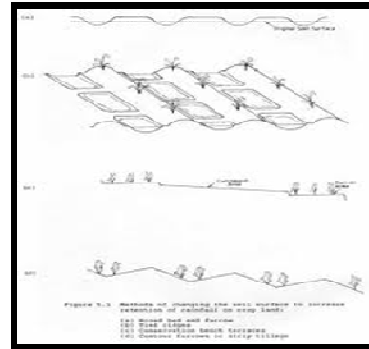
Pitting - The creation of small basins or pits to catch and hold precipitation on the site has been used since the dust bowl days of the 1930s Known as pitting, it is often used in conjunction with reseeding to enhance seedling establishment by concentrating nutrients and water. The value of pits in water retention depends on their density, size, depth and soil permeability. The pit effectively serves as a basin to collect water and allow soil penetration.

Pitting has been effective in increasing forage production by as much as 100 percent, primarily due to enhanced water relations

Basin listing- Small basins are formed along the contour with an implement called basin lister. These will hold water for some time.



Basin listing



Pitting

Sampling is concerned with the selection of a subset of individuals from within a statistical population to estimate characteristics of the whole population

- (a) **Random sampling** - random sample (SRS) of a given size, all such subsets of the frame are given an equal probability. Each element of the frame thus has an equal probability of selection: the frame is not subdivided or partitioned.
- (b) **Non Random sampling-** Non-probability sampling is a sampling technique where the samples are gathered in a process that does not give all the individuals in the population equal chances of being selected. In this sampling, the samples are chosen according to the subjective judgement of the observer. It purely depends on the experience and knowledge of the observer.

Q6. Briefly describe the Grazing system. How succession of grassland will be affected by over grazing.

Grazing generally describes a type of feeding, in which a herbivore feeds on plants (such as grasses.)

Grazing systems

In the 19th century, grazing techniques were virtually non-existent. Pastures would be grazed for long periods of time, with no rest in between. This led to overgrazing and it was detrimental to the land, wildlife, and livestock producers. Today, ranchers have developed grazing systems to help improve the forage production for livestock, while still being beneficial to the land.

Seasonal

Seasonal grazing incorporates “grazing animals on a particular area for only part of the year”. This allows the land that is not being grazed to rest and allow for new forage to grow.

Rotational

Rotational grazing “involves dividing the range into several pastures and then grazing each in sequence throughout the grazing period”. Utilizing rotational grazing can improve livestock distribution while incorporating rest period for new forage.

Deferred rotation

Deferred rotation “involves at least two pastures with one not grazed until after seed-set. By using deferred rotation, grasses can achieve maximum growth during the period when no grazing occurs.

Succession of grassland effected by over grazing

The direct effect of herbivore on vegetation includes modifications to plant growth, reproduction and architecture. In grazing systems, sustainable productivity and the long-term survival of plants depends on reproductive success and the establishment of new generations. Herbivores affect the productivity, composition and stability of plant communities through their influence on germination, establishment and mortality. With respect to plant succession, plants have been classified as either **decreasers, increasers or invaders** depending on their response to

grazing Those plants that make up a large proportion of the community but become reduced in number through grazing are known as **decreasers** Those that increase in number, either because of their greater tolerance to defoliation or because they are less used by herbivores than other plants, are known as **increasers**. If grazing pressure is maintained, any bare patches formed could be occupied by herbaceous annuals unpalatable perennials or shrubs that were previously absent or limited in number. These plants, known as **invaders**, are undesirable for livestock production because they displace more acceptable species, are of lower nutritive value, and have erratic or very seasonal production pattern Where grazing is intense, it has been suggested that plants with adequate defence mechanisms and which are not very acceptable to herbivores will dominate the plant community The most common result seen in pastures used by animals that browse infrequently is the progressive invasion of shrubs The substitution of species could modify the quantity, quality and variability of biomass production altering the initial uptake and eventual flow of energy through the ecosystem. This could lead to new modifications in the botanical composition of the In the plant dynamics of pastureland, three types of change can be appreciated: **fluctuation, regression and progression**. Fluctuation refers to reversible changes in the dominance of species within a community in equilibrium, while progression and regression are directional changes in plant composition and dominant which might be irreversible. When the composition of species changes and their contribution to overall production moves away from the climax vegetation, the condition of the pasture is reduce through regression **Regression** therefore implies degradation, and in pasture management this term is used to describe the substitution of perennial species by annuals, or that of palatable by unpalatable species **Progressive** directional changes —**progression**— occur in the opposite direction and represent the recovery of ecosystem structure after disturbance. On many occasions, succession following the cessation of grazing does not lead to the re-establishment of the initial vegetation. After a certain **threshold**, systems may not be able to return to their **original state**.

Q7. Briefly describe about the types and distribution of rangelands in the world

Rangelands are vast natural landscapes in the form grasslands, shrublands, woodlands, wetlands, and deserts. Types of rangelands include tallgrass and shortgrass prairies, desert grasslands and shrublands, woodlands, savannas, chaparrals, steppes, and tundras.

Types of rangeland

Prairie

Prairies are considered part of the temperate grasslands, savannas and shrublands biome by ecologists, based on similar temperate climates, moderate rainfall, and grasses, herbs, and shrubs, rather than trees, as the dominant vegetation type. Temperate grassland regions include the Pampas of Argentina, and the steppes of Eurasia.

Grasslands

Grasslands are areas where the vegetation is dominated by grasses (Poaceae) and other herbaceous (non-woody) plants (forbs). However, sedge (Cyperaceae) and rush (Juncaceae) families can also be found. Grasslands occur naturally on all continents except Antarctica.

Steppe

Steppe, in physical geography, refers to a biome region characterized by grassland plain without trees apart from those near rivers and lakes. The prairie (especially the shortgrass and mixed prairie) is an example of a steppe.

Pampas

Pampas are the fertile South American lowlands that include the Argentine provinces of Buenos Aires, La Pampa, Santa Fe, Entre Ríos and Córdoba, most of Uruguay, and the State of Rio Grande do Sul, in the southernmost end of Brazil covering more than 750,000 km² (289,577 sq mi).

Scrubland

Scrubland is a plant community characterized by vegetation dominated by shrubs, often also including grasses, herbs, and geophytes. Shrubland may either occur naturally or be the result of human activity. The term "shrubland" was first coined in 1903.

Woodland

Woodland is a low-density forest forming open habitats with plenty of sunlight and limited shade. Woodlands may support an understory of shrubs and herbaceous plants including grasses.

Woodland may form a transition to shrubland under drier conditions or during early stages of primary or secondary succession.

Savanna Savanna is a grassland ecosystem characterized by the trees being sufficiently small or widely spaced so that the canopy does not close. The open canopy allows sufficient light to reach the ground to support an unbroken herbaceous layer consisting primarily of C4 grasses.

Desert

Desert is a landscape or region that receives an extremely low amount of precipitation, less than enough to support growth of most plants. Deserts are defined as areas with an average annual precipitation of less than 250 millimetres (10 in) per year or as areas where more water is lost by evapotranspiration than falls as precipitation.

Tundra

Tundra is a biome where the tree growth is hindered by low temperatures and short growing seasons. The term *tundra* comes through Russian тундра from the Kildin Sami word *tūndâr* "uplands," "treeless mountain tract."

Distribution of rangeland in world

Canada

Rangeland is a prominent feature of rural Canada. Certain rangelands are preserved as provincially-protected areas similar to parks, others are managed as community resources.

United States



Rangelands of The United State

Of the land within the United States borders, 36% is considered rangelands. The western side of the United States is 53% rangeland.^[18] Around 399 million acres (1,610,000 km²) of rangeland are privately owned.

North American rangelands - grasslands

- Tall Grass Prairie
- Mixed Grass Prairie
- Short Grass Prairie
- Pacific Bunchgrass
- Annual Grasslands



Australia

About 75% of Australia's land mass is Rangeland. 53 of Australia's 85 bioregions have rangelands. In Western Australia, rangelands cover about 87% of the state's 2.5 million square kilometres. Australian Rangelands support most of their economy

South America

Rangelands in South America are located in regions with climate ranging from arid to sub-humid. Annual precipitation in these areas ranges from approximately 150 to 1500 mm (6–60 inches). Within South America, rangelands cover about 33% of the total land area. South American rangelands include; grasslands, shrublands, savannas, and hot and cold deserts.

Africa

In Kenya, rangelands make up for 75% of the land surface area, and are largely inhabited by nomadic pastoralists who are largely dependent on livestock.

Asia-China

In the past, rangelands in western China supported a pastoral economy and large wildlife populations. Now the rangelands have shrunk due to population growth, economic, government, and social factors. Rangeland types in China include; Semi-desert, Dry Alpine Grasslands, Alpine Dwarf Shrub, Wetland types.