**Salahaddin University – Erbil 4th class  
College of Agriculture Range management  
Field Crop Department Practical part**

**Range management –practical**

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**Range:** The range is a very extensive natural pasture.

**Range crops**: Its natural plants (legumes. Grasses, shrubs) grazing animals on it.

**Range management: -**

Range management is the manipulation of rangeland components to obtain the optimum combination of goods and services for society on a sustained basis.

**Goals of range management: -**

1. Increasing protect of range to save water.
2. Protect of plants that have high nutrient value.
3. Protect of soil and its fertility from erosion.
4. Supply grater amount of animal production (milk, wool, and meat).

**Kind of pastures:**

1. **Natural pasture or Range Land**:

Natural or native pastures are uncultivated lands occupied wholly or mainly by native or naturally introduced plants useful for grazing. The chief types are as follows:

1. *Ranges*.
2. *Brush*.
3. *Wood land*.
4. *Cut-over or stump pastures*.
5. **Man-made or Tame pasture:**

Tame pastures consist largely of domesticated pasture plants, growing on land that has been cultivated, and are used mainly or entirely for grazing livestock.

There are several different kinds of tame pastures as follows:-

1. *Permanent*.
2. *Rotation*.
3. *Temporary or Supplemental*.
4. *Annual* (An annual pasture)
5. *Predominating plants*.

**Rangeland important: -**

1. Mainly source of forage for livestock and animals, and continues of animal production.
2. Cause to increasing underground water.
3. Add organic matter to the soil. They have a beneficial effect on soil structure.
4. They are especially effective in controlling erosion.

**Reason for the deterioration of pasture: -**

1. Drought
2. Grazing sinner
3. Overgrazing
4. Fire

**Range Deterioration: -**

1. Damage of range.
2. Remove of variety plant.
3. Cause to change of ecology balanced.
4. Decreasing plants that have high digestibility.
5. Soil erosion.

**How protect nature range: -**

1. Re-vegetation of rangelands.
2. Making enclosure around the rangeland.
3. Studies of plants that removed in this place.
4. Managing rangeland as a scientifically.

**Study plants in natural pastures and technological methods**

A test of many of the natural phenomena under specific circumstances has contributed significantly to the advancement of science, and this test depends on gathering a large number of individuals or units which is characterized by some of the properties of all common cores.

Total community members or units of any kind are called in statistics (group or Population) and the units of each community are broadly similar, but they not are identical.

For any special recipe under study, they show differences concrete between the constituent units of the population for example, when studying the heights achella in a pasture are seeing that these elevations ranging between (55-65 cm) that any quantitative or qualitative show a difference of one unit to another in the same population and called variable.

**The important studies which must be done in the pasture:-**

1. Determine the total density covered by the plant in the pasture.
2. Determine the kinds proportion in the plant coverage (Relative composition of vegetation).
3. Determine the replication of kinds, (Relative frequency of vegetation).
4. Relative of kinds of palatability and not in the pasture.
5. Relative of similar by the shape (stand, bunch, sod).
6. To determine duration of germination, flowering, seeds, and fruits forming.
7. To determine of total pasture productivity on the pasture or productivity of various kinds of the forage (the green, hay, dry).
8. Determination of what’s consumed by animals from natural forages.

**How to investigate natural pasture:-**

Some important points which must be done during conducting experiment on the natural pastures.

1. Conducting the premiering investigation in the pastures before employing wide experiments.
2. The land of experiment must present every kind of topography and general plantation in the region.
3. The plots of the experiment area must be convenient to the number of animals (if there’s in an experiment) and enough replication not less than three.
4. Investigation of the vegetation (plant cover) us for kinds of plants, total area covered by plants (Total Density) the percentage of species in the vegetation, the species must be replicated and the forage productivity.
5. The changes fixing which happened on the vegetation during the seasons of the year.
6. Using the webbed cage or building litter fences to take samples from it in order to comparing with the samples which be taken from the open area (land) fore pastures.
7. The samples must be taken randomizing by the convenient number from all the direction of the pastures to increasing from it especially when the plant coverage not similar.
8. The animal numbering and recognizing every group from anther by color or definite symbol and the animals inter the experiment from the same genus and the same age and the weight and with a good health.
9. The number of animals in every plot must not be less than three and it’s better to be five or more.
10. To insure the water and the excess forage in every plot.
11. Recording the specially data about the soil, weather data, scientific and local name of plants and take photo of all the experiment.
12. Co-operating with the offices which have relations and the specialists in the field.
13. The experiment must be repeated for three year or more.

**Techniques of vegetation studies**

There are many ways and techniques that can be obtained to estimate the quantitative or qualitative vegetation as well as soil characteristics in rangelands and included quantitative estimate number of plants and how much they operated from the surface of the ground and height and weight as well as the existing species and the proportion of each of them and models of life and vigor plants and the amount of growth and so on. The qualitative estimate includes determining the nutritional value of forage plants and the extent of palatability by the animal. And restrict this information in determining a plan to exploit the pasture in terms of Stocking Rate a lot of utilization and means of improvement that can be followed for the maintenance of vegetation.

The mainly qualities characteristics to vegetation:-

There are four qualities characteristics that can be measured for any plant species found in vegetation:-

1-**Frequency**: - the number of times that observed in the type number of times observation, it can be found by percentage, frequency reflects the extent of homogeneity in the distribution of the type of pasture.

2 - **Number**: - Total plants of one type that are found in a number of plots and the number of crosses on the extent and type abundance for others. Usually several categories typically used to express the extent of such abundance (rare, infrequent, frequent, abundant and very abundant).

The area of plots is used to measure the Number is 1m2 rangeland grass 4m2 or more in the bushes, in the pasture annuals dense slabs used smaller plot depending on the density of vegetation.

3 - **Area** **Covered**: - its percentage of the crowns of the plants covered by the Earth's surface and is the area covered consider of the most commonly used measurements to indicate the amount of undergrowth in the pasture, include the following: -

a - **Density**: -its percentage covered by undergrowth of the soil surface when viewed from the top surface (foliage density’s).

b - **Basal** **Area**: - is the ratio of plants basal operated of the soil surface at a height of 2.5 cm from the surface of the ground and that the proportion occupied by the basal of the plants are directly related to the ability of vegetation to protect the soil from erosion and is usually the largest in herbal vegetation compared with shrubs.

4 - **Weight**: - the plants weights are considered for judging the true extent of its growth and production of forage. Weight is measured on the of either green or dried aerobically or by hot air at a temperature of 60-105 C°, and can weigh the following components: -

a- **Areal** **Biomass**: - a group that shoots above the soil surface.

b- **Browse**: - a branch of trees and shrubs that can be eaten and the animal will be in his reach.

c- **Forage**: - a selected part of the growths herbaceous plants that can be eat by the animal And comes specifically because of the use of, or the need to leave the part of shoots to renew growth. Naturally, that both forage and browse forms part of the total grass or vegetative growth on the surface of the soil.

**Sampling techniques:-**

There are different methods for studies the natural plants, of the most common is the quadrates, transects, and point, but they must be choose the convenient one, and according to the nature of the kind of plant used for.

1. **Quadrats method:-**
2. It’s used wood or metal quadrats with an area (1m2) or rectangular with (0.5 m2) to determine the density of plant or the empty area from plants.
3. The rectangle is divided for example into (50) parts equally, so determine the density of the plant in every little quadrat separately and the data should be taken.
4. The scanning must be done for all the quadrats which are laid randomly in the pasture to know the proportion or the ratio of covered area by the plant then determined the total average.
5. Its prefer to increase the number of plants in irregular plant pasture, and when we want the density of some covered are by certain plant, so the diameter of few plants, and determine the average and multiply by the number of plants noted in the quadrat.
6. Whets concern to the sample area or quadrats, it must be selected a convenient area to the plant coverage, for example when the study is about bushes, a bigger quadrat must be used (4m2) and so that when the research is in tree forests and about big trees, its preferred to take samples (100 m2).
7. If we want to know variables or the differences which happen on the plants because of pasturing, fixed enough numbers of quadrates randomly in different places in the opened area of the pasture for pasturing to investigate during periods of the seasons of the year.
8. The quadrats are picked up from the study area or land after well examining so that they must be return then to the same places, and their paces must be marked by iron stake with covered by the soil in order to not injure the animals. So the data got from the opened pasturing area are compared with the data got from non-pasturing area or compared with samples got under the cage made of the webbed wire.
9. The size of the cage or fences differs according to the kind of the plant studied. So when studies big bushes great cages or fences should be used, but, when grass plants is studied little cages is used like (1m2) area of the quadrats used.
10. To know the study of the range or to what extent is the kinds of certain plants in the pasture, laid quadrats with an area (0.5m2) or less and fixed on the land consequently on lines with a space (5m2) between them and in different directions then check the plants in the quadrats for counting the frequency of the kinds and their lashing.

**Measure degree of the frequency in quadrats:-**

Degree of the density at quadrat an area (0.5m2) divided into some degrees according to number of plants

1-4 Rare (R)

5-14 infrequent (I)

15-29 Frequent (F)

30- 99 abundant (A)

More than100 Very Abundant (VA)

Number of quadrats of occurrence of a species

Frequency = ------------------------------------------------------------------- ×100

Total number of quadrats on one line

Summation of degree density (VA+A+F+I+R)

Average of Abundant = ---------------------------------------------------------------

No. of quadrats of occurrence of a species

Index Number = Average of Abundant \* Frequency

**Example:-**

Assuming fixed 50 quadrat on the pasture ground on one line and occurrence specie of the plant at 4 quadrats were the degree of the density in first quadrat (I) and at second (F) and at third (F) and at fourth (A). Found?

1. Frequency?
2. Average of Abundant at Index number?

Frequency of the plant= 4/50 × 100 = 8%

Summation of density degree = 5+15+15+30 = 65

In order we take first number from recorded density degree at the table and summated the first number I (5), F (15), and A (30)

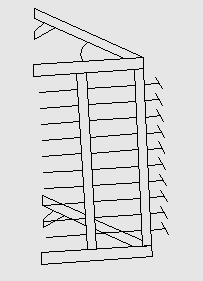
Average of Abundant = 65 / 4 = 16.2

Index number = 16.2 × 0.08 = 1.3

This number denote found the plant at that part from the little pasture. Must be the number of dominant between 80 - 100 plants.

1. **Pin-Point Method**

Point sampling is a modification of the point quadrat method, to evaluate range vegetation. Point quadrat utilized a frame containing a row of 10 steel pins that established 10 sample points at each sampling station. Stations were randomly located, and all vegetation touched by each pin as it was projected downward was recorded as "hits" (a hit = 1 item of data).



**Point frame with inclined pins**

Example:-

Assuming the pin touched plants 700 times in sample its number (1000), this meaning in this part of pasture the density is (70%). If the number of touching the end of pin at Basel of vetch was for example (350) time:-

Density = (700/1000) 100 = 70%

(350/700) 100 = 50%

1. **Step-Point method:-**

The only equipment needed is the observer's boot with an indicator to define the sampling point. The tip of one boot should be marked with a small V-shaped notch or narrow permanent line. The marker is placed at the boot tip to provide a consistent sampling point and to minimize disturbance to the vegetation before sampling. The notch or line should be as narrow as possible to avoid overestimation of cover.

**Example:-**

If we take 100 lines or sample to different directions in pasture (or 10000 steps) recorded data as follow:-

|  |  |  |
| --- | --- | --- |
| Species | No. point | Summation |
| Barley  Medic  Clover  brassica  Brome grass | 5,5,1  5,5,5,1  4  1  5,5,2 | 11  16  4  1  12 |
| Total |  | 44 |

Total density= (44/100)\*100 = 44%

Kind composition= summation of point / total density \*100

Composition of first kind (barley) = (11/44)\*100=25%

Composition of second kind (medic) = (16/44)\*100=36.3%

Composition of third kind (clover) = (4/44)\*100=9.1%

Composition of fourth kind (brassica) = (1/44)\*100=2.2%

Composition of fifth kind (brome grass) = (12/44)\*100=27.4%

Area covered by first kind= 11%

Area covered by second kind= 16%

Area covered by third kind= 4%

Area covered by fourth kind= 1%

Area covered by fifth kind= 12%

1. **Line transect method:-**

A transect line is any line, marked at regular intervals, that is easy to use in the field. Transect lines can be purchased commercially, made from measuring tape or rope marked off at regular intervals.

The following is a step-by-step procedure for using the line transects method to measure the percentage of crop or plant ground cover.

**Step one:** Lay out a 100 – 50 meter line diagonal to row direction. Anchor both ends in a row. Avoid placing the line in end rows and areas affected by flooding, drought, weed or insect infestations.

**Step two:** Walk along the line or tape and straight down at each recoding point. Record the number of points that are directly over a species. As you record numbers, remember to

* Always look at the same side of the line,
* Avoid moving the tape while counting. And
* Look straight down.

**Step three:** The total number of intersections you found equals the percentage of ground surface covered by plant. If 44 out of 100 points intersect plant, then you have 44 percent plant coverage in this area of the field.

**Step four:** Repeat the procedure at five different locations in the field and average the results to arrive at an estimate of plant cover for the entire field.

**Example:**-

If we take line or a sample length (10 m) and recorded this data:-

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Plant name** | | | **Samples** | | | | | | | | | | | | | | | | | | | | **summation** |
| **1** | **2** | | **3** | | **4** | | **5** | | **6** | | **7** | | **8** | | **9** | | **10** | | |
| Birds foot Trefoil | | **3** | | | **-** | | **5** | | **-** | | **1** | | **4** | | **2** | | **2** | | **1** | | **7** | **25** | |
| Bermudagrass | | **4** | | | **1** | | **3** | | **-** | | **4** | | **-** | | **5** | | **-** | | **3** | | **4** | **24** | |
| Lespedeza | | **-** | | | **4** | | **-** | | **3** | | **1** | | **4** | | **-** | | **3** | | **2** | | **2** | **19** | |
| Kentucky | | **1** | | | **3** | | **1** | | **-** | | **3** | | **-** | | **-** | | **5** | | **-** | | **2** | **15** | |
|  |  |  | | |  | |  | |  | |  | |  | |  | |  | |  | |  | **83** | |

Total density covered by plants = (83/1000) \* 100= 8.3%

Frequency species = summation of sampling/total sampling \* 100

Frequency first species = (25/83) \* 100 = 30.1%

Frequency second species = (24/83) \* 100 = 28.9%

Frequency third species = (19/83) \* 100 = 22.9%

Frequency fourth species = (15/83) \* 100 = 18.1%

Area cover = (summation of sampling/1000) \* 100

Area covered by first kind = (25/1000) \* 100 = 2.5%

Area covered by second kind = (24/1000) \* 100 = 2.4%

Area covered by third kind = 1.9%

Area covered by fourth kind = 1.5%

**Lap (6)**

**Kinds of plots and sample in pasture investigations.**

1. **List Quadrat.**
2. **Count Quadrat.**
3. **List- Area Quadrat.**
4. **Basal- Area Quadrat.**
5. **Temporary and Permanent plots.**
6. **Denuded Quadrat.**
7. **Clip Quadrat.**
8. **List quadrat**:- Before taking the sampling must give importance to know the kind of plant and then the appropriate quadrat is selected on the basis of the nature of, The following are we include models in a way to register with some observations:

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency** | **Total Quadrat** | **Quadrat No.** | **plant species** |
| **60**  **70**  **10** | **6**  **7**  **1** | **1-2-5-7-8-10**  **1-3-4-5-7-6-9**  **6** | **Plant A**  **Plant B**  **Plant C** |

1. **Count quadrat**:- To supplement the list quadrat can add the number of plants of each type of species that are found and so-called list quadrat and summed up the way calculates the number of individuals each type exists and is recorded in the same form special list quadrat and placing the number in parentheses after the quadrat number or below as shown in the form below, and that the registration number shows exuberance, The following table or what is called the count quadrat form:

|  |  |  |
| --- | --- | --- |
| **Sum of qu. &sum of kind** | **Quadrat No. & No. of Plants** | **Plant Species** |
| **6**  **(35)**  **7**  **(40)**  **1**  **(9)** | **10 8 7 5 2 1**  **(3) (10) (2) (1) (15) (4)**  **9 7 6 5 4 3 1**  **(4) (4) (1) (15) (8) (6) (2)**  **6**  **(9)** | **Plant A**  **Plant B**  **Plant C** |

1. **List-Area quadrat:-** This quadrat is used to know the land area covered by each type is done by dividing the quadrat into smaller quadrats and then measure the number of small quadrats or parts which filled every kind. Uses the quadrat of the rib 1m in many studies after that divides by wire filament to smaller boxes, each 100 cm2.
2. **Basal- Area Quadrat**:- This method aims to estimate or measure the area of ​​the base of each type and total bases species, the area of ​​the base in environmental studies and natural pastures means that area of the Earth's surface covered by the Root Crowns or the area of ​​land that penetrate the stems a recipe are important because they measure the effects of climate and pastoral and soil conditions in the long term. Area of ​​the base is usually measured at the height of 1 inch above the Earth's surface, where roughly determined by the level of grazing, but in some cases it may be at a lower height measurement of less than inch.
3. **Temporary and permanent plot**:- temporary plot used on a temporary basis to study the current or existing conditions without regard to the change in the future. The permanent plot or the fixed by pin wood or iron in the center of the circle (if circular) or in the north-west corner or the south-east corner (in square or rectangular plots) and in general the permanent plot is used in studies that include changes in vegetation and the most famous permanent plots are permanent Quadrat.
4. **Denuded Quadrat**:- the denuded quadrat is a plot square in shape, just from the undergrowth, is used in the detailed study of the process of regrowth (Revegetation) after the strips of undergrowth in different ways as fire or water immersion or remove the roots and rhizomes and seeds from the soil and thus can determine the speed of the invasion of undergrowth and installed himself in the denuded quadrat, which represents abstract stripped, it may be the denuded quadrat other form non quadrat, depending on the circumstances.
5. **Clip quadrat**:- Uses this type of plots in grazing sites to measure the amount of production forage grazing or clipping. And summarized down to work to cut off the plant feed in the quadrat at the heights above the ground may be different for different purposes of study and nature, clipping material in this way, air dried or in an oven temperature range (100 – 110 c°) to get the Oven Dry Weight. The study here requires two clipping the plants for early spring and late summer plants in addition; they may require the study of the production of a type of plant species in the quadrat and not all species. Mowers way in this type of plots at different heights from the surface of the earth not represent in fact a way which animal grazing the plant, which is characterized by withdrawal (pull) and broken stems or branches of flower and leaves are inconsistent and at different heights.

**Quality Tests of pasture**

In order to obtain information for both: -

1 - **Nutritional Value: -** are the chemical analysis of the forage plants or by grazing animals and measuring the increase in weight or quantity of production during the grazing thus judge the forage value as animal feed.

2 - **Palatability: -** a relative appetite that deals with animal plants when there is the opportunity to choose among a number of plants. And is a key factor in determining the type of animal and pasture capacity of animals.

Palatability is non-fixed recipe they vary depending on the following factors: -

1 - Type of animal, age and state of health.

2 - The degree of hunger and need for animal feed.

3 - Existing plant species.

4 - Environmental conditions (soil fertility, provide rainfall, temperature, etc.).

**Palatability assessment methods**

1. **Percent of Utilization**

They determine the percentage of utilization of animal by each plant species in a number of spaces in a pasture land. Arrange species Descending depending on how palatable animal can follow this method to compare a range of feed cultivated so that the estimated weight of feed existing of each type and then leaves the animal to feed freely in the field, and then re-estimate the weight forage after grazing, and order conditions in the weight can be arranged species depending the extent its palatability.

1. **Feeding Minutes**

It is the number of minutes spent by the animal in each type during grazing in the pasture and grazing most palatable is the kind of animal who is serving in the parish and longer than other species.

1. **Cafeteria Test**

Which provides for equal amounts of animal feed of every type of feed and estimated the consumer part of each of them after a certain period the type who consumed a greater proportion be the most palatable than others.

**Lab (7)**

**Define some common terms**

**Forage donam**: -Is the theoretical donam its density (100/100) or (10/10) of the forage, which can be utilized within the limits of endurance for plant physiology, and the number of donams a measure of the value of forage fodder for the secondary kind.

**Forage donam factor**: -Is a guide (index) it expresses that part of pasture encased by plant the available that can grazing a whole without damage, it reflects the relative value of the feed (forage).

For example: - if the dense undergrowth in donam 50% and half of this area was confront to proper grazing the factor of donam forage for this donam is 25% (50%×50%).

**Forage Donam Requirement**: -

The number of forage donams required for Animal adult that grazing for a certain period without damaging wealth pasture.

* Usually expressed by sheep / month or cow / month.
* Adult Cow alone or with her Weaning = animal unit
* Sheep female alone or with her Weaning = 1/5 animal unit.

**Animal unit:-**

The measure is considered a target capacity of grazing when estimating the number of animals that graze in the pasture without causing damage sources grazing. In this case, the idea of ​​unity animal unnecessary.

The adult cow with weight of 450 kg with a small calf aged 6 months or less is considered animal unit (A. U.) For the purposes of measuring the capacity of grazing

The animal unit monthly means the amount of forage required per animal unit for one month

Some examples: -

\*600 A.U.M. Means forage available for 600 animal unit for one month without damage pasture.

\*50 A. U. for one year: - means provide fodder for 50 animal unit for 12 months (full year).

\*100 animal unit for a period of 6 months: - It mean, provides fodder for 100 animal units for a period of 6 months.

\*150 animal unit 4 months: - means provide fodder for 150 animal units for a period of 4 months.

**Animal unit conversion factors**

That means **animal unit** is one cow with a small calf and the **grazing capacity** in units of animal means of feed available during a certain period, but the cows are not the only animals that enter the pasture, there are other animals such as sheep, goats, horses, bull, and donkeys In this the situation of these animals must be converted into animal unit depends on its food to a relatively mature cow and this is happening to apply a conversion factor of animal units to all these varieties of grazing animals.

The conversion factor animal unit knows many numbers are as follows: -

|  |  |
| --- | --- |
| **Animal type** | **conversion factor** |
| Mature cow with calf | 1.0 |
| Bull | 1.25 |
| Cow calf | 0.6 |
| Calf annual age 12-17 month | 0.7 |
| Calf annual age 17-23 months | 0.75 |
| Calf two years from 24 to 32 months | 0.9 |
| Deer | 0.2 |
| Sheep with pregnancy | 0.2 |
| Ram | 0.2 |
| Goats and serious | 0.17 |
| Goats and Billy-goat | 0.17 |
| Horse | 1.25 |

**Animals Rate:**

Is the actual number of animals expressed in animal units or months unit animal which grazing in a specific area in a given time, and expresses the rate of the animals on the basis of acres or hectares for feed unit one animal and one month or for several months or for one year. For example, the rate of the animals to graze in the mountains of Iraqi model can be expressed as follows:

26 donam of the one animal unit and for one year

The term **grazing capacity** differs from the term **animal rate**, first means (grazing capacity) the number of animals that have the food for a certain period and within a specific area. The (animal rate) is the number of donams or hectares of grazing necessary to give the one animal unit food for a period of one month or for several months or for one year.

**The fodder needs of the one animal unit:-**

Research shows in the United States that a mature cow with her ​​calf with a weight (450 kg) needs to (9 kg) of feed (in dry weight) for one day. But the cows in the mountainous in Kurdistan region with the local soil small size rarely weighing up to weight the model, which is 450 kg as the weight of the cows in Kurdistan have up to 300 kg so it is that the cow with her ​​calf as a one animal unit needs to 6 kg almost fodder for one day.

**Accounts to measure the grazing capacity:-**

1 - Total forage production: - The total forage production is all production figures palatable forage species and medium and which can be obtained in the basic pasture suitable for different vegetation in the pasture.

2 - Forage available: - The feed animals available for consumption is estimated by dividing the total number forage production on No. 2, and this means that the investment ratio of 50% for grazing and the other part remains in the ground to sustain pasture.

3 - Calculate animal units: - The animal unit per need 6 kg of dry forage grass for one day as the forage available should be divided on a 6 figure for the total units of animal feed, which is available to it for one day. This figure is divided when given to 30 animal units monthly, when the division of the latter figure to 12, it gives the number of units that are available for animal feed them for a period of one year, and so for the (3, 4 or 6) months by the length of grazing.

Animal unit = amount of forage / 6

Animal unit monthly = amount of forage / 6 x 30

Animal unit for one year = amount of forage / 6 x 30 x 12

Example: In the pasture total area 4,000 hectares, the area of ​​the different types of vegetation as follows: -

|  |  |
| --- | --- |
| Area of different kind of plant covers | forage yield of hectare for different kind |
| 1500ha | 400 kg/ha |
| 600 ha | 950 kg/ ha |
| 900 ha | 800 kg/ha |

The total forage production is as follows:

Total forage production = suitable area x amount of forage production in this area

1500 × 400 = 600000 kg

600 × 950 = 570000 kg

900 × 800 = 720000 kg

Total = 1890000kg

Because the ratio of investment is 50% of the available forage so divides the total forage production on 2

1890000 / 2 = 945000 kg amount of available forage.

Unity animal laws

Animal Unit = amount of forage / 6

Animal units that consume this forage in one day = 945000/6 = 157500 A.U. / day

Animal unit monthly = amount of forage/ 6 x 30

Animal units that consume this forage in one month = 945000/ 6 x 30 = 5250 A.U / month

Animal unit for one year = the amount of forage / 6 x 30 x 12

Animal unit that consume this forage for 1 year = 945000/6 x30 x 12 = 437.5 A.U. /one year

**General survey of the resources of natural pasture**

* Forage value factor =factor utilization proper x kind composition
* Forage donam factor = density x factor value forage
* Donam forage = Forage donam factor x total area

**Account accommodate pasture know the density and the amount of grass**

If we assume that one of the plants, weeds grow in the area of ​​donam of pasture and covers 10% of the area and this is plant gives 200g of grass in one square meter, what is the number of days of grazing per unit animal if we know that factor utilization proper is 80% and the forage requirement is 16% monthly donam forage.

Forage donam factor = density x factor utilization proper

= 10% x 80% = 0.08 factor donam forage

Donam forage = factor donam forage x area

= 0.08 Х 1 = 0.08 donam forage

0.08 donam forage / 0.16 donam forage requirement monthly = 0.5 month

Any 15 day / animal unit, or the equivalent of 15 daily animal unit.

**Calculate the amount of forage available to utilization proper and pasture accommodate of knowledge of the amount of density and grass:**

If we take some of the numbers in the previous example, the calculation is as follows:

2500 m2 (donam area) x 10% cover of vegetation = 250 m 2 of grass in donam. Or  
2500x 200 g / m2/1000 = 500 kg / donam.

500 kg x 80% (utilization proper) = 400 kg forage accessible within the utilization proper.  
400 kg x % 33.7 = 135 kg forge accessible within the dryer utilization proper /donam.  
Note / forage ratio of dried green fodder = 33.7%  
And if we know that what belong to the cow which weighing 450 kg is about 270 kg feed dryer aerobically month in natural pastures (or about 55 kg of it per sheep), the number of months which can take care of the unit animal in this donam is:  
135/270 = 0.5 months (15 days / animal unit) or (15 animal units per day).

**Lab (8)**

**The main quantitative characteristics of the vegetation**

There are four main characteristics that can be measured for any plant type found in vegetation: -

**First**: **frequency**: - the number of times that the one type observed in a number of times observation and repetition frequency expanse the homogeneity in the distribution of type on pasture land.

**Second**: **Number** (**kind** **composition**): - Total one type plants that are found in a number of plots and the number reflect the availability of the kind for others. Usually several categories used to express the extent of such abundance (few recurrent, recurrent, abundance, and rare). Area is used for plots measuring 1 m2 for herbal pasture land and 4 m2 or more in the bushes in dense grassland annuals used smaller plots depending on the density of vegetation.

**Third: Area Covered: -**

Percentage covered by the crowns of the plants from the earth's surface and is considered covered area by plant the measurements of the most commonly used to denote the amount of undergrowth in the pasture, include the following:

1 - **Density: -** is the percentage covered by undergrowth of the soil surface when viewed from the top surface.

2 - **Basal Area: -** is the percentage occupied by the basic of the plants from the soil surface at a height of 2.5 cm from the surface of the earth and the percentage of plants basic operated directly related to the ability of vegetation to protect the soil from erosion and is usually the largest in the herbal vegetation compared shrubs.

**Fourth: Weight: -** The plants consider honest criterion for judging the growth and production of forage. Weight is measured on the basis of either the green undergrowth or dried with hot air at a temperature of 60 - 105 C°, and can weighted the following components: -

1 - **Areal Biomass (vegetative growth): -** a shoots above the soil surface

2 - **Browse**: - the branches of trees and shrubs that an animal can eat it.

3 - **Forage**: - a selected part of the growths herbaceous plants that can be eaten by the animal and the selection comes because of palatability or the need to leave a section of the shoots to determine growth. Usually that both forage and browse are formed of the vegetative growth on the surface of the earth.

**Fifth: Quality Tests of pasture**

In order to obtain information for both: -

1 - **Nutritional Value: -** are the chemical analysis of the forage plants or by grazing animals and measuring the increase in weight or quantity of production during the grazing thus judge the forage value as animal feed.

2 - **Palatability: -** a relative appetite that deals with animal plants when there is the opportunity to choose among a number of plants. And is a key factor in determining the type of animal and pasture capacity of animals.

Palatability is non-fixed recipe they vary depending on the following factors: -

1 - Type of animal, age and state of health.

2 - The degree of hunger and need for animal feed.

3 - Existing plant species.

4 - Environmental conditions (soil fertility, provide rainfall, temperature, etc.).

**Palatability assessment methods**

1. **Percent of Utilization**

They determine the percentage of utilization of animal by each plant species in a number of spaces in a pasture land. Arrange species Descending depending on how palatable animal can follow this method to compare a range of feed cultivated so that the estimated weight of feed existing of each type and then leaves the animal to feed freely in the field, and then re-estimate the weight forage after grazing, and order conditions in the weight can be arranged species depending the extent its palatability.

1. **Feeding Minutes**

It is the number of minutes spent by the animal in each type during grazing in the pasture and grazing most palatable is the kind of animal who is serving in the parish and longer than other species.

1. **Cafeteria Test**

Which provides for equal amounts of animal feed of every type of feed and estimated the consumer part of each of them after a certain period the type who consumed a greater proportion be the most palatable than others?

**Sixth: The measure of production: -**

**1 - Calculation of production per hectare: -**

If you use a square spot, the calculation of production per hectare is very easy and by multiplying the average dry weight of the feed from the spot (one square meter) number (10) and be yield kg of forage / ha.

**2 - Calculate the proportion of plant species composition: -**

When you know the rate of the dry weight of each type individually and in total dry weights of feed at the spot, troubled percentage weights of the species that make up the forage species.

**3 - Measurement of forage available: -**

- All Types clipped and weighted have no once nutritional value where the degree of preference for some high and some other medium or low-lying, as long as the proportion of each type of total production known can be extracted known species palatable or non-palatable or medium.

- The degree of preference depends on the type of animal species that are used pasture species that have a high degree of preference for cows may become its degree low or medium for sheep and vice versa.

- don’t measure the non-palatable species when estimating grazing capacity for which it shall be non-palatable species weight of the total weight to measure the production of feed (kg / h).

- Feed produce of palatable species or medium only counted when measuring grazing capacity: -

For example, palatable species in an area of ​​10 m2 = 143g and non-palatable species = 220g  
or the total species = 363 g / m2 10 = 363 kg / ha

Because palatable species weight 143 kg, and if the pasture area is 300 hectares, the weight of palatable species:  
143x300 = 42900 kg / 300 hectares.

**Lab ( 9 )**

**Qualitative assessment of pasture**

**Quality**: - is the ability of forage crops and grazing on the provision of food, which contains the necessary nutrients to build tissue and growth heterogeneous and energy necessary materials for the operations of various, vital.

**Factors affecting the quality of the forage: -**

1 - **the plant age** : the grazing and forage plants at the beginning of growth, a high percentage of protein, vitamin A and carotene, and less than the ratio of fiber and carbohydrates due to the increased proportion of the vegetative and stems are tender.

2 - **Type of plant fodder**: - forage legumes contain less fiber and dry matter and richer in protein, carotene and calcium compared with grasses plant.

3 - **soil** - soil that contains a high percentage of nitrogen increase vegetative growth and leads to increase the percentage of protein and carotene, especially in grasses. Forage crops contain phosphorus, potassium and calcium related to the presence of these elements in the soil is absorbable.

4 - **Method Agriculture**: - Cultivation forage mixtures more balanced in the processing needs of the animal, including foodstuffs and lead to an increase protein in grasses as a result of the roots of legumes, nitrogen excretion well with the nutritional value and palatability grassy plants compared to if they were planted individually.

5 - **Frequent mowing**: - frequent mowing leads to plant fodder to encourage vegetative growth and increase the quantity and quality of green fodder crop which can be obtained throughout the season, which would leave the plant fodder until maturity.

6 - **Method utilization**: - Direct grazing of animals that the best way to choose when grazing tender parts of the plant with palatability and high quality and balanced nutritional value.

7 - **Weather conditions**: - have an important role on the amount of yield and nutritional value as the soil moisture continued to lead the more of vegetative growth and increase protein and digestibility. Heat lead to speed maturity and reduce susceptibility to increase fiber digestion.

**Methods of assessing the quality of forage crops and grazing**

**First** - **the chemical composition**: - This method is used to estimate the chemical components of chemical analyzes, of these components: -

1 - **Carbohydrates**: -include starch and sugars and organic acids and fiber. Complex carbohydrates such as cellulose and hemicellulose. The percentage of carbohydrates in forage plants and pasture 60-85% depends on the maturity and quality.

2 - **Protein**: - is a compound of great importance and consists of materials Nitrogen. Its percentage in legumes higher than grasses.

3 - **Mineral elements**: - consisting of ash formed by burning forage martial which containing main mineral elements in the animal nutrition and percentage depends on the fertility of the soil. The most important of these elements: P, Mg, K and trace(rare) elements: boron, cobalt, iron, sodium, zinc and chlorine.

4 - **Vitamins**: - forage crops contain a lot of vitamins necessary for the growth of plants and animals, including A, B, C, D this ratios are affected by type of plant, the period of growth and climatic conditions.

5 - **Fat**: - forage crops contain a low percentage of fat.

Of these compounds can be judged on the quality of forage crops. Plant containing a high proportion of protein and low in fiber increases digestion and is good quality, and are affected by the quality of growth and maturity stage of the plant.

**Secondly - IVDMD In Vitro Dry Mater Disappearance**

Using method (Tilly, Terry) with the amendments proposed by Barens. Conducted this way digest sample weighing 250 g of material forage grinding in the laboratory, where insert her leachate digestive taken from the paunch animal added by material buffer in a test tube and placed in the incubator for 48 hours without the air and then in addition to acid HCL and substance pepsin then placed in the incubator for 24 hours after the sample is filtered on filtered and then washed with water and dried.

**Digested material = loss of weight in incubator/ weight of sample ×100**

It’s found a lot of researchers say that whenever increase the percentage of fiber in forage crops the percentage of digestibility. The forage in the high percentage of digestion is good quality.

**Third - the rate of eating animal fodder (Intake): -**

Average daily forage given to the animal - average daily fodder rejected (remaining) by the animal.

consumption is calculated as a percentage of the animal's Body weight.

Body weight % = Average daily forage / animal weight ×100