Animal Production

Level II

Learning Guide # 45

Unit of Competence: Participate in Forage Development

Module Title: Participating in Forage Development

LG Code: AGR APR2 M14 0919 LO1-45

TTLM Code: AGR APR2 TTLM 0919V1

LO2: Undertake forage development activities

Instruction Sheet	Learning Guide # 45

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics –

- Following and clarifying Instructions and directions
- Undertaking forage development activities
  - Applying different forage seed sowing methods
  - Identifying and applying fertilizer and irrigation/watering
- Recording Seasonal growth pattern of forage crop for harvesting time
- Undertaking seed selection and treatment techniques
- Setting Pests, weeds and diseases control methods

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to –

- follow and clarify instructions and directions
- undertake forage development activities
- record seasonal growth pattern of forage crop for harvesting time
- undertake seed selection and treatment techniques
- sett pests, weeds and diseases control methods

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3, Sheet 4 and Sheet 5
4. Accomplish the “Self-check 1, Self-check t 2, Self-check 3, Self-check 4 and Self-check 5” **in page -4, 12, 15, 22 and 25** respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1” **in page - 26.**
6. Do the “LAP test” **in page – 26** (if you are ready).

Information sheet – 1	Following and clarifying Instructions and directions

Any employee who works in forage development or any farmer who establish Pasture must follow the following instruction and direction:-

- Forage enterprise policies and procedures
- Manufacturer instructions
- Material safety data sheets (MSDS)
- OHS standards and procedures
- Specifications for tools, equipment's and materials
- Standard Operating Procedures (SOP)
- Verbal directions from manager or supervisor
- Work instructions and standards
- Work notes.

Instructions and directions provided by supervisor must be followed and if we have any question we can ask when necessary. And also employee must observe and follow Enterprise policies and procedures in relation to workplace practices in the handling and disposal of materials.

Self-Check-1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List instruction and direction for forage development. (6 points)

Note: Satisfactory rating – 4 points unsatisfactory rating –below 4 points

You can ask you teacher for the copy of the correct answers

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions:

1._____

Information sheet – 2	Undertaking forage development activities

Undertaking forage development activities may include determining seeding rate, maintaining forage, land preparation, seed selection, seed treatment, mulching, sowing, ploughing, furrowing, weed control, transplanting, fertilizer application and irrigation /watering, etc.

1.1. Ploughing

A **plough** or **plow** is a tool or farm implement used for initial cultivation to loosen or turn the soil in preparation for sowing seed or planting. Ploughs were traditionally drawn by working animals such as oxen and horses, but in modern farms are drawn by tractors. A plough may be made of wood, iron, or steel frame with an attached blade or stick used to cut and loosen the soil. It has been a basic instrument for most of history, and is one of the most significant inventions. The earliest ploughs were wheel less, with the Romans using a wheel less plough called the *aratrum*, but Celtic peoples began using wheeled ploughs during the Roman era.
The primary purpose of ploughing is to turn over the upper layer of the soil, bringing fresh nutrients to the surface, while burying weeds and the remains of previous crops and allowing them to decay. As the plough is drawn through the soil, it creates long trenches of fertile soil called furrows. In modern use, a ploughed field is typically left to dry out, and is then harrowed before planting. Ploughing and cultivating a soil homogenises and modifies the upper 12 to 25 centimeters (5 to 10 in) to form a plough layer, where the majority of fine plant feeder roots grow.

Ploughs were initially human-powered, but the process became considerably more efficient once animals were pressed into service. The first animal-powered ploughs were undoubtedly pulled by oxen, and later in many areas by horses and mules, although various other animals have been used for this purpose. The industrial revolution brought steam engines to pull ploughs, ploughing engines or steam tractors, which were gradually superseded by internal-combustion-powered tractors. Use of the plough has decreased in some areas, often those significantly threatened by soil damage and erosion, in favour of shallower ploughing and other less-invasive conservation tillage techniques.

1.2. Mulching

Mulch is a layer of material applied to the surface of soil. Reasons for applying mulch include conservation of soil moisture, improving fertility and health of the soil, reducing weed growth and enhancing the visual appeal of the area. Mulch is usually, but not exclusively, organic in nature. It may be permanent (e.g. plastic sheeting) or temporary (e.g. bark chips). It may be applied to bare soil or around existing plants. Mulches of manure or compost will be incorporated naturally into the soil by the activity of worms and other organisms. The process is used both in commercial crop production and in gardening, and when applied correctly, can dramatically improve soil productivity.

1.3. Transplanting

Transplanting or **replanting** is the technique of moving a plant from one location to another. Most often this takes the form of starting a plant from seed in optimal conditions, such as in a greenhouse or protected nursery bed, then replanting it in another, usually outdoor, growing location. This is common in market gardening and truck farming, where setting out or planting out are synonymous with transplanting. In the horticulture of some ornamental plants, transplants are used infrequently and carefully because they carry with them a significant risk of killing the plant.

Transplanting has a variety of applications, including:

- Extending the growing season by starting plants indoors, before outdoor conditions are favorable;
- Protecting young plants from diseases and pests until they are sufficiently established;
- Avoiding germination problems by setting out seedlings instead of direct seeding.

Different species and varieties react differently to transplanting; for some, it is not recommended. In all cases, avoiding *transplant shock*—the stress or damage received in the process—is the principal concern. Plants raised in protected conditions usually need a period of acclimatization, known as hardening off (see also frost hardiness). Also, root disturbance should be minimized. The stage of growth at which transplanting takes place, the weather conditions during transplanting, and treatment immediately after transplanting are other important factors.

1.4. Applying different forage seed sowing methods

Sowing practice

a) Timing: The most desirable time to seed non-irrigated areas is immediately before the season of the most reliable rainfall, and when temperature is favorable. Sow perennial species at the onset of the longest wet season when the soil has received sufficient moisture to support germination and establishment. The best seeding date depends on the area of the state, soil moisture and whether grasses or legumes are being seeded.

- **Grasses**: sown after the rainy season because grasses need continuous soil moisture for optimum development and do not have storage organs to stay any longer.
- **Legumes:** sown within one month before the small rainy season because they have got storage organs.

b) **Spacing:** Generally, spacing between rows should not exceed 25–45 cm and within-row plant spacing should be 5–15 cm.

c) Sowing depth: Generally, the smaller the seed the shallower the depth of planting. Usually, grasses are sown at the depth of 1–1.5 cm, while medium-sized legume seeds are sown at a 2.5 cm depth. This is usually related with seed size, seeding emergency, and survival of small seeded species. The optimum depth of:

- Most grasses and small-seeded legumes lie between 1 to 3cm, but varies according to species or cultivars and care should be taken.
- The largest seed of legume placement between 3-5cm below the soil (like leuceanea, susbania, cowpea, lablab) and
- The smallest seed not more than 0.5cm.

Method of sowing

1. Row-sowing
2. Broadcasting
3. Spot seeding

Row-sowing is preferred because it offers the following advantages:

- Low seed rate is required, which is important in view of seed scarcity and cost.
- Better establishment than by broadcasting in case of poor weather conditions.
- Easy weeding and fertilizer application.
- Better exposure of plants to sunlight.

Common establishing methods of establishing forage plants are:

- ✓ Direct seeding (Broadcasting, Spot seeding, Row seeding)
- ✓ Seedlings
- ✓ Cutting &Splits

The choice for these methods of establishment is determined by plant species, planting material availability &environmental conditions.

Generally, the following guide can be used:

***Tree legumes**: seedlings, cuttings, and direct seeding

***Herbaceous legumes**: Direct seeding

***Grasses**: Direct seeding, cuttings, and splits

1.5. Identifying and applying fertilizer and irrigation/watering

1.5.1. Fertilizing and manure application

For grass-seed crops, nitrogen is the most limiting soil nutrient. Generous amounts of nitrogen, often in combination with phosphorus, substantially increase seed yield of grasses (100–150 kg/ha diammonium phosphate). Nitrogen application varies with soil fertility, moisture level and the type of species sown. Legume seed crops are independent of soil N levels as long as they effectively fix atmospheric nitrogen.

Improved pastures require fertile soils for optimal herbage production. Basal applications of the macronutrients, especially nitrogen (100–150 kg/ha urea) and phosphorus (50 kg/ha triple superphosphate) are helpful for successful establishment. However, considering the economic status of farmers, use of farmyard manure, as much as possible, is advisable at the rate of 5–10 tons/ha (t/ha). If the pasture to be established contains a good proportion of adapted and readily nodulating legumes, the nitrogen application may be ignored or reduced to a starter dose (10–25 kg urea/ha) in anticipation of atmospheric nitrogen fixation after some weeks by the legume component.

Fertilizers should be applied according to the fertility status of the soil. To determine what nutrients are needed:

- Observe characteristic symptoms, e.g., leaf yellowing is likely a nitrogen deficiency.
- Undertake soil and plant tissue analysis.

- Know the characteristics of the plant, e.g., tall and rank-growing grasses such as elephant grass and *Panicum* species are heavy feeders and require more frequent fertilizer applications than thinner and shorter stature grasses.

Generally, legumes have a high requirement for phosphorus (P), sulphur (S) and Molybdenum (Mo); grasses have a high requirement for nitrogen (N), P, and Potassium (K). Levels of nutrients used will depend on soil type, species used, level of production required, and production system (cut-and-carry systems require greater maintenance inputs than grazing systems). Typical levels of nutrients required for annual maintenance are 50–300 kg/ha N; 10–20 kg/ha P; 25–50 kg/ha K; 30 kg/ha S; and 100–200 kg/ha Mo. Nitrogen is often applied at each grazing or cutting. Phosphorus should also be applied especially if the legume component loses vigor due to grass dominance. Manipulating the ratio of application of nitrogen and phosphorus is a useful management technique to maintain a desirable balance between the grass and legume components.

Nitrogen fertilization increased yield, rate of growth and improved CP content during the earlier part of growth. Additionally, DMY and sward quality can be increased through means of fertilizer application, resulting in an abundant feed stuff. After fertilizer N is applied, N is rapidly absorbed in to plants and growth, while stimulated via improvement of root systems and photosynthetic activity. The mineral composition of range plants depends upon various environmental factors such as geographic aspects, climate, soil minerals, grazing stress, seasonal changes and the ability of plant to get minerals from soil. Application of inorganic fertilizer can significantly improve the productivity and quality of grass lands. CP values lower than 8% are considered to be of inferior quality. Leaf CP content decreased as the leaf aged, but increased as the rate of nitrogen fertilizer increased.

Nitrogen plays an important role in plant growth and physiological processes, as it enters all enzymes composition and enhances vegetative growth and yield. Nitrogen is a constituent of the proteins that participate actively in the synthesis of the organic compounds that comprise the vegetative structure, and it is responsible for size related characteristics of the plants such as plant height, size of leaves and stem, and shoots emergence and development. Experiments conducted with fertilizers have shown that N application increases dry matter production, the maximum amount of N to be applied depending upon the grass species and type of management. The dry matter yield of the grass component increased as the level of nitrogen fertilizer increased.

1.5.2. Applying irrigation/watering

Irrigation schedules, where required, are determined for each soil and crop/pasture type based on assessed water requirements, rainfall and evapo-transpiration data. All plants require water. Some are more drought tolerant than others. Some can survive on rainfall alone, whereas others have very high demands for water at specific times in the growing cycle. These plants require an irrigation system to provide water at the right place, at the right time and in the right quantities. The use of natural resources in the agricultural sector is coming under increasing scrutiny by regulators and the community.

There are a number of irrigation methods used, including flood, hand line, wheel line, gated pipe, little and big gun, linear, and pivot irrigation systems. The method of choice depends on the system that came with the farm, the size of the farm and the amount of labor, time and money available.

Determining when to irrigate and how much water to apply are specialized tasks. Though many techniques exist, monitoring soil moisture may be the easiest irrigation scheduling technique. This technique can help you determine when to irrigate, whether irrigation periods are sufficiently spaced, and whether the proper amount of water is applied during each irrigation time. See the resources for more information that the end of this article for a useful field test for estimating soil moisture. During the growing season, the soil should dry out to about 50% of the soil water hold capacity before it is irrigated back to its capacity. Water holding capacity is a determined by soil texture, organic matter content, and soil depth. The time between irrigations varies depending on the time of year.

Moisture evaporates from the soil and plants are said to transpire, that is, they give off moisture through their leaves. Considered together, these two processes are referred to as evapotranspiration. Evapotranspiration or average daily water loss from the soil plant system varies by season. As you might guess, water losses are greater during the hot, dry, longer days of summer than at any other time of year.

If your goal only is to have a green pasture, irrigate whenever the weather is dry. If you irrigate for production, follow an irrigation management plan based on the infiltration rate, water-holding capacity of the soil, and amount of moisture lost to evapotranspiration. Use weather and soil information to ensure adequate but not excessive irrigation..

Do not leave large livestock in the pasture while irrigating; they may damage equipment. To avoid plant damage and soil compaction, wait 3 or 4 days after irrigating before turning large

livestock back onto pastures. As always, wait until the pasture is above 6 to 8 inches in height before grazing, and graze no shorter than 3 inches.

Irrigation is artificial watering of land to sustain plant growth.

It is practiced in all parts of the world where:-

- Rainfall does not provide enough ground moisture
- In areas of irregular rainfall
- During dry spells to ensure harvests and to increase crop yields

It has greatly expanded the amount of arable land and the production of food throughout the world.

Irrigation methods:-

- Sprinklers
- Flooding
- Furrow irrigation
- Drip or trickle irrigation

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Reason out why mulching carry out in forage development? (4 point)
2. List methods of sowing forage seed (3 point)
3. List different types of irrigation methods for forage development (5 point)

Note: Satisfactory rating – 8 points unsatisfactory rating –below 8 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions:

1._____

2._____

3._____

Information sheet – 3	Recording Seasonal growth pattern of forage crop for harvesting time

Seasonal growth patterns of forage may include annual and perennials based on life forms. Annuals complete their life-cycles in one year while perennials survive for more than two growing seasons. Each stem of annual grasses bears an inflorescence. Perennial grasses also bear inflorescences but may also produce vegetative tufts which may flower within two or more years. In the tropics grasses and legumes tend to be annual or perennial. The growth of an annual starts and finishes within one year while perennials exhibit cyclic patterns of growth.

✓ **Annual**

- Life duration is < 1 year (one season)
- Good seeder (produce abundant seed),
  - survival mechanism
  - Overcome hard season.
- Fast establishing
- Low persistence (do not stay productive for long period)
- Best utilized as fodder crops, i.e. crops grown for one season & harvested for hay or silage.
- Low level of nutrition, but depends on type of species
- Are pioneers in degraded land (the 1st in plant succession)

Examples;

- ☞ Oats (*Avena sativa* L.)
- ☞ Vetch (*Vicia dasycarpa* L.)

✓ **Perennials**

- Survive from 1-3 years or more
- have long life span (are more persistence, give production for longer time)
- seed production- low when compared to annuals
  - ☞ Cocks foot (Orchard grass) (Dactylis glomerata L.)
  - ☞ White clover (Trifolium repens L.)
  - ☞ Buffel grass (Cenchrus ciliaris L.)
  - ☞ Colored Guinea grass (Panicum coloratum L.)

- ☞ Elephant grass (Napier grass, English or Zihone sar, Amharic) (Pennisetum purpureum)
- ☞ Rhodes grass (Chloris gayana)
- ☞ Para grass (Brachiaria mutica (Forsk.) Stapf)
- ☞ Guinea grass (Panicum maximum)
- ☞ Green leaf (Desmodium intortum)
- ☞ Common stylo (Stylosanthes guianensis (Aublet) Swartz)
- ☞ Lucerne (alfalfa) (Medicago sativa L.)

When selecting plant species for seed production it is important to consider their life cycles (annuals vs. perennials)

- Annual legume have a better chance of growing in drier climates than perennial legume species as long as the wet season is sufficiently long and reliable to complete seeding
- In annual species seeding is synchronized and hence easy to manage and harvest
- Annuals are suitable where there is a distinct wet and dry season
- Perennials cannot survive in drier environments with short growing seasons
- However, annuals cannot respond to out of season precipitation as the moisture may not be reliable and long lasting
- Perennials give a longer sequence of seed production than annuals.

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List characteristics of annual and perennial forage development (10 points)
2. Give an examples for perennial grass species (10 points)

Note: Satisfactory rating – 10 points unsatisfactory rating –below 10 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions:

1._____

2._____

Information sheet – 4	Undertaking seed selection and treatment techniques

Before sowing it is useful to determine the viability of the seeds (if not commercial and guaranteed) by carrying out a germination test. Some seeds may also require seed treatment and inoculation (only legume seeds).

4.1. Seed quality test

There is a need to use high quality seed to establish the pasture. Quality is measured in terms of purity and germination. If commercial seed is considered, it is fair to request for a recent seed analysis statement for the seed to be sown, since this will show the quality details. Purity is expressed in terms of the percentages of seed of the sown variety, other crops and weeds, of inert matter (including pieces of straw, soil etc.), and of broken seed. Special attention must be given to the weed seed in the sample so as not to introduce new, potentially serious weeds into the pastureland.

Seed quality is an important parameter to look into before sowing of seeds. This seed quality is defined first by the proportion of seeds which will germinate and secondly by the freedom of the seed from contamination by seeds of different genetic constitution, by inert material or by pests and diseases. Other considerations before sowing of a seed include viability, longevity in storage, vigour, germination rate, dormancy, origin and size of the seeds.

- **Viabilit**y is the capacity of the seeds to germinate after sowing. When the seed (comprising an embryo and endosperm energy reserves, surrounded by a seed coat or test and other outer coverings) is placed in a moist environment falling within a specific temperature range, it absorbs moisture and various biochemical changes begin. Clearly a high content of dead seed which will not germinate represents a loss to the purchaser and many countries lay down minimum standards of seed viability which the supplier of the seed is required to meet. For this reason a simple germination test is necessary.

- **Rate of seed germination**

A rapid rate of seed germination is often beneficial to field establishment. Competition with fast germinating weeds or survival before soil drying are both favored if the seeds sown germinate quickly. This can be considered as the probability of a proportion of seeds in a seed lot

germinating in a given period of time and should not be confused with the total viability of the seed lot. Rate of germination may be broken up into two independent periods: the latent period from the onset of imbibition's to the visible bursting out of the radicle in the first germinating seeds, and the subsequent germ ability of the sample. Therefore, seed testing data which give an indication of the rate of germination will help the seed user buy seed with good establishment prospects.

Germination test procedures

- ✓ Place the blotting paper in the germination tray (shallow dish) and moisten it. Do not wet the paper;
- ✓ Place 100 seeds in the tray, scattering them evenly along the shallow dish;
- ✓ Keep the tray at room temperature;
- ✓ Keep the blotting paper moist all the time
- ✓ Check the seeds once a day and count the germinated ones
- ✓ Continue this for a week
- ✓ Express the number that sprouted on percentage basis
- ✓ Make three replications or repeat it three times

- **Contamination (purity) analysis**-The forage seeds that are used for sowing should not have materials that are not needed for the purpose. This contamination can occur in two ways:
  - ❖ Contamination by 'off types' in which within a seed lot of one cultivar another cultivar can be mixed. Such contamination reduces the superiority of the genotype sown and restricts the possibility of using the pasture for further seed production
  - ❖ A second form of contamination is the inclusion of inert material - chaff, dust, pieces of straw, soil, etc. in the seed lot. The amount of this inert material is measured by the analysis for 'purity'. When determining seeding rates or comparing prices of seed lots it is useful to calculate the pure live seed (**PLS**) content of a seed lot, which is the product of percentage viability and percentage purity.

When determining seeding rates or comparing prices of seed lots it is useful to calculate the pure live seed (**PLS**) content of a seed lot, which is the product of percentage viability and percentage purity.

For example, if the seeding rate required is 100 medium sized seeds per m^2.

And that 1 kg is equivalent to 300,000 seeds in number, then to sow 100 ha grazing land we need to have 333 kg PLS.

Here is the calculation:

$1m^2$ ===> 100 seeds

$1000\ 000m^2$ (100 ha) ===>X

X= 333 kg PLS

If the purity is 80% and germination 70%

From 100 kg - 80 are pure

From 1 kg ===> X

X= 0.8 kg pure seeds

100 ===> 70 germinable

0.8 ===> X

$X = \frac{0.8 \times 70}{100} = 0.49$

0.8kg ===> 0.49 kg PLS

X ===> 333 kg PLS

$X = \frac{0.8 \times 333}{0.49} = 544$ kg

Therefore, an estimated 544 kg seeds are required to obtain 333 kg PLS.

Another example of using this PLS concept is in comparing prices of seed lots. Consider two seed lots of P. maximum; lot A is of 90% purity and 60% viability and retails at 8 Birr per kg; lot B is of 80% purity and 40% viability and retails at 5 Birr per kg.

When a comparison is made regarding their price on the PLS concept,

The price per kg PLS for lot A is 8/0.9 x 0.6 = 15 Birr

The price per kg PLS for lot B is 5/0.8 x 0.4 = 16 Birr (more expensive)

- ***Seed longevity*** -Viability is the first criterion of quality. However, the maintenance of this viability for long time periods may be an important consideration for the seed user who stores seed for sowing in a subsequent year. In these circumstances dormant seeds (legume seeds) will maintain viability. The death of seeds is increased by high seed moisture content (which is influenced by the relative humidity of the storage atmosphere), by high temperature, and a high oxygen content of the storage atmosphere.
- ***Seed Vigorousity-*** There is difficulty in defining and measuring this concept of seed vigorousity. Generally it implies that ability to germinate over a wider range of environmental conditions, reliable establishment in the field and higher yields.
- ***Seed dormancy***- This is a natural protective phenomenon which prevents all the seeds of a population from germination on one occasion (hence minimizes risks in uncertain habitats). This allows the prevention of loss of all soil seed reserves serving as an insurance measure in unreliable environments. Dormancy can be embryo dormancy in which the embryos are physiologically inactive, due to inactive enzyme systems. The second type of dormancy is associated with seed coat characteristics. The seed coat may mechanically constrict the expansion and growth of the embryo, prevent the entry of moisture and gases (example legumes), or contain a chemical which inhibits germination (example in Buffel grass, *C. ciliaris*).

4.1. Seed treatment

Seed treatments techniques:-

- ✓ Chemicals
- ✓ Physical
- ✓ Biological

Different types of seeds require different treatments for optimal germination. The main purpose is to break their dormancy in order to improve seed flow characteristics, allow rhizobium inoculation and protective chemicals to surround the seed. There are different methods of reduction of seed hardness. These include:

- Hot water treatment or scarification
- inoculating legumes
- Acid treatment

Methods of breaking seed dormancy

Storage: Holding freshly harvested seed in storage will overcome dormancy problems since dormancy declines with time. Storage is often applied to grass seeds

Scarification: Scarification treatments are employed prior to sowing to abrade the seed coat and improve permeability, e.g., most legume and some grass seeds such as *Cenchrus, Melinis,* and *Paspalum notatum* require scarification.

4.2. Seed rates

Seed rate depends primarily on the viability and purity of the seed. Furthermore, seed rate depends on seed size, pure stand or mixture, amount of rainfall the purpose of the crop (herbage or seed), pattern of planting and soil fertility. As a general guideline, for row planting, sow grasses at 6–8 kg/ha, legumes at 3–4 kg/ha, and fodder shrubs at 10–15 kg/ha. When broadcasting seed, sow at double the rate recommended for row planting. The following table illustrates some of the recommended seeding rates.

No.	Forage species	Seed rate
1	Chloris gayana/ Rhodess grass	3-5 kg/ha
2	Callide Rhodes	10 kg/ha
3	Baffle grass	10 kg/ha
4	Trefolium tembensa	5 kg/ha
5	Fodder beet	10 kg/ha
6	Trifolium quartinianum	5 kg/ha
7	Siratrro	4 kg/ha
8	Lablab	20 kg/ha
9	Trueppellianum	5 kg/ha
10	Setaria	10 kg/ha
11	Cow pea/ vigna ungiculata	20 kg/ha
12	Marculatus	6 kg/ha
13	Alfalfa/Medicago sativa	10 kg/ha
14	Green leaf	5 kg/ha
15	Seca	4 kg/ha
16	Medicago truncatula	10 kg/ha

17	Leucaena palide	Seedling
18	Red clover	6 kg/ha
19	Trefolium steudneri	5 kg/ha
20	Verano	6 kg/ha
21	Vetch	20 kg/ha
22	Panicum coloratum	15 kg/ha
23	Tree leucerne	Seedling
24	Tallfescue	15 kg/ha
25	Melilotusalba	10 kg/ha
26	Phalaris acutica	15 kg/ha
27	Oat/avena sativa	10 kg/ha
28	Susbania	Seedling
29	Elephant/Napier grass	Cut & splits

Self-Check -4	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What are the essential criteria's to select quality seed of forage? (4 points)
2. List methods of forage seed treatment (3 point)
3. List some grass seeds and its rates of sowing (3 pts.)

Note: Satisfactory rating – 7 points unsatisfactory rating –below 7 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions:

1._____

2._____

3._____

Information sheet – 5	Setting Pests, weeds and diseases control methods

1.1. Weed control

Weed reduces the yield of seed by competing for:-

- ✓ Soil moisture
- ✓ Nutrients
- ✓ Sunlight
- ✓ Seed quality by contamination with weed seeds

Production of high quality seed requires a weed free pasture. Grower should never rely on seed cleaning as a means of overcoming weed contamination. Weeds especially broad leaved once can be dangerous, leading to partial or complete failure. Legume seed forage is particularly vulnerable to weed invasion.

Weeds affect seed yields and quality. Efficient weed control reduces contamination with weed seeds during harvesting.

- ➢ Thorough and repeated cultivation, hand weeding, use of herbicides, crop rotations, etc., offer a reasonable degree of weed eradication.
- ➢ Weed control methods are chemical, physical and biological.

1.2. Pest and Disease control

- ➢ Birds are the most damaging pest for grass and seed crops
- ➢ Insect pests including moth caterpillars, sucking bags and butterflies are more severe pests for legumes, often seen feeding on pods and flowers.
- ➢ Diseases are generally more severe with legumes than with grasses.
  - ✓ The more important legume diseases are rhizoctonia leaf bright, anthracnose in stylos, and rust on siratro viruses on many species.
  - ✓ Grass suffers mostly from fungal disease like ergots and smuts.
- ➢ Pests like mole rats, porcupines, wild herbivores and insect pests can be a threat to pasture seed crops.

- Insect larvae of the Sesbania beetle (*Mesoplatis orchoptera*), for example, can devastate plots of stands overnight.
- Control measures against such serious insect pests could be expensive at an advanced level of infestation and thus prompt spot-spraying at the earliest detection with recommended chemicals is necessary.
- Diseases, especially fungal, are more serious in grasses than in legume seed crops.
- Disease-control measures in forage crops are based on the use of resistant crop varieties and employing pre-emptive cultural practices such as:
    - crop rotations
    - burning of infected plants
    - solar treatment of soil
    - use of clean and treated seed

Self-Check -5	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List ways of forage weed control (4 points)
2. What are pests that affect forage/pasture in your district? (4 points)
3. By what mechanisms disease control taken measures from forage crops? (5 points)

Note: Satisfactory rating – 8 points unsatisfactory rating –below 8 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions:

1._____

2._____

3._____

Operation sheet -1	Procedures in forage seed germination test

Techniques to test germination of forage as follows:-

Step 1: Place the blotting paper in the germination tray (shallow dish) and moisten it. Do not wet the paper;

Step 2: Place 100 seeds in the tray, scattering them evenly along the shallow dish;

Step 3: Keep the tray at room temperature;

Step 4: Keep the blotting paper moist all the time

Step 5: Check the seeds once a day and count the germinated ones

Step 6: Continue this for a week

Step 7: Express the number that sprouted on percentage basis

Step 8: Make three replications or repeat it three times

LAP Test	Practical Demonstration

Task. Test seed germination rates of forages

REFERENCE

www.https:// articles. Extension.org. Nutritional requirements of livestock

Duguma Gemeda. 2010. Participatory definition of breeding objectives and implementation of community based sheep breeding programs in Ethiopia. PhD Thesis, University of Natural Resources and Life Sciences, Vienna, Austria.

Muhammad, R. 2016. Elephant grass as forage for ruminant animals. Department of Forage Crops and Grassland Management, Faculty of Animal Science, Hasanuddin University, Indonesia.