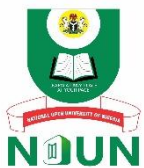


**COURSE
GUIDE**

**ANP304
FORAGE AND FODDER CROP PRODUCTION**

Course Team DR. M. R. HASSA (Course Writer/Developer)
 Prof. G. E. Jokthan (Course Editor/Programme
 Leader) NOUN
 Dr. Samuel Awolumate (Course Coordinator) -
 NOUN



NATIONAL OPEN UNIVERSITY OF NIGERIA

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National Open University of Nigeria
Headquarters
University Village
Plot 91, Cadastral Zone
Nnamdi Azikiwe Expressway
Jabi, Abuja

Lagos Office
14/16 Ahmadu Bello Way
Victoria Island, Lagos

e-mail: centralinfo@nou.edu.ng
URL: www.nou.edu.ng

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Introduction

Pasture and forage production is a two unit degree course meant for all students offering animal production and its related courses at the National Open University of Nigeria. Sustainable and profitable livestock production can be achieved through proper production, utilization and management of pastures and forages worldwide. Pasture and forage crops remained the primary sources of feed for different categories of livestock in Nigeria.

Pasture is defined as an area of land covered with grasses, herbaceous legumes, forbs, shrubs and trees used for livestock feeding or environmental protection. This is usually referred to as grassland. Forage refers to any aboveground plant material used for feeding livestock, but excluding concentrates and other industrial by-products. Pastures and forages could be artificially sown or occur naturally. Natural or native pastures are found in rangelands, river banks, road sides and abandoned lands while sown pastures are found in commercial farms, universities, colleges of agriculture and some research institutes in Nigeria.

It is imperative to note that pasture and forage crops have diverse advantages in the current dynamic and highly challenged system of livestock production. The study of pasture and forage production enable us to understand the linkage between the various ecosystems (biotic and a biotic) within the grassland or rangeland. This will motivate us to come up with methods of conserving and protecting our environment from destruction through poor management. It also teaches us how to produce qualitative forage for sustainable livestock production. This will in turn help to boost the income level of farmers and improvement of livelihoods. Similarly, study of pasture and forage production will assist in providing employment and recreational opportunities to a lot of people in Nigeria. Some industries such as pharmaceutical industries will be encouraged to expand their economic base since most of these pasture and forage crops have strong aesthetic values.

What You Will Learn in this Course

This course guide contains the overall summary of what you will learn in this course. The course is divided into 7 modules which are further simplified into 19 units for better understanding. Also, the relevant course materials that will assist you to gain an insight into the course are included in the course guide. The time required to successfully complete each unit of the course is included in this guide.

Methods of evaluation in this course are included in the form of Tutor Marked Assignments, practical(s) and Final Examination. You will be guided by the course facilitator on how to conduct the practical(s). This course will teach you the basic theory and practice in pasture and forage production in Nigeria.

Course Aim

The aim of this course is to provide the basic principles of pasture and forage crops production with emphasis on native pastures, improved pastures and forage crops in Nigeria.

Course objectives

Specific objectives have been set up in order to achieve the aim of the course. Each unit has its own objectives which you should be familiar in due course. At the end of this course, you should be able to:

1. Define the meaning of pasture and forage crops as related to livestock production.
2. Identify the common pasture and forage crops in your locality.
3. Describe in detail the advantages and disadvantages of pasture and forage crops production in Nigeria.
4. List the scientific and common names of at least three pastures and forage crops.
5. Understand the morphological structure of grasses, legumes and browse plants.
6. State the steps to consider in pasture establishment.
7. Describe the relationship between various components of the pasture ecosystem.
8. Explain the various methods used in improving and maintaining a good pasture.
9. Compare different combinations of mixed pastures in terms of productivity and uses.
10. Demonstrate the morphological differences between various pasture species.
11. Relate the current trend in pasture production in Nigeria with the pasture seed production level.
12. Illustrate the various methods of conserving pasture for livestock feeding.
13. Recognize other valuable feed resources used during dry season period.
14. List and justify the use of different grazing management systems for better livestock feeding.

Working through this Course

This course is a practical course which needs a lot of your time to read, understand and demonstrate the knowledge gained into practice. Therefore, you need to study the course guide which has been broken into units. Each unit explores different aspects of pasture and forage crops production. At the end of each unit, there is an assignment as part of the evaluation process in this course. You are expected to submit the assignment to your facilitator at the agreed date and format for marking.

Course Materials

- a. Course guide
- b. Suggested activities
- c. Assignments
- d. Text books and References

Study Units

Module 1 Classification of Pasture and Forage Crops

- Unit 1 Terminologies in Pasture and Forage Crops Production
 Unit 2 Morphological characteristics of grasses, legumes and shrubs

Module 2 Types of Pastures Based on Productivity and Uses

- Unit 1 Native Pastures
 Unit 2 Improved Pastures
 Unit 3 Pastures Associated with Crops

Module 3 Types of Pastures Based on Duration

- Unit 1 Temporary Pastures
 Unit 2 Semi-Permanent Pastures Unit 3 Permanent Pastures

Module 4 Pastures in Nigerian Agriculture

- Unit 1 Role of Pastures in Nigerian Agriculture
 Unit 2 Factors affecting successful Pasture Establishment in Nigeria

Module 5 Pasture Establishment for Forage and Seed Production

- Unit 1 Steps in Pasture Establishment
 Unit 2 Pasture Harvesting and Processing Methods

Module 6 Pasture Management and Improvement

- Unit 1 Choice of Species
- Unit 2 Fertilizer Application
- Unit 3 Pasture Defoliation
- Unit 4 Forage Conservation Techniques Unit 5 Weed Control

Module 7 Grazing Management System

- Unit 1 Concept of Grazing Management
- Unit 2 Types of Grazing Management Systems

Text Books and References

Barnes, R.F., D.A. Miller, and C.J. Nelson. (1995). Forages, the Science of Grassland Agriculture. 5th Ed., Vols. 1 and 2, Iowa State University Press, Ames, IA.

Bogdan, A.V. (1977). Tropical Pasture and Fodder Plants (Grasses and Legumes). Tropical Agriculture Series. Longman london

Hanson, A.A. (1990). Practical Handbook of Agriculture. CRC Press, Boca Raton, FL. Humpherys, L.R. (1991). Tropical Pasture Utilization. Published by the press syndicate of The university of Cambridge NY.

Langer, R.H.M. (1994). Pastures, their Ecology and Management. Oxford University Press, Auckland 3, New Zealand.

Murphy, B. (1991). Greener Pastures on your side of the Fence. 2nd Ed., Arriba Publishing, Colchester, VT.

Semple, A.T., and T.E. Woodward. (1946). A Pasture Handbook. USDA Miscellaneous Publication 194, U.S. Gov. Printing Office, Washington, DC.

Assessment

You will be assessed using two evaluation methods in this course as follows:

- i. The tutor marked assignment (TMA)
- ii. The final examination

Tutor-Marked Assignment

The Tutor-Marked Assignment comprised the continuous assessment component of this course. It accounts for 40% of your total point scores. You will be given two Tutor-Marked Assignments and one practical by your facilitator. The assignments should be submitted for grading to the facilitator before the date of the final examination.

Final Examination and Grading

The final examination in this course will comprise of a written examination in which you will be graded based on 60%. The final grade will be computed by adding your scores in the Tutor- Marked Assignment (TMA) and the examination component. The date and time of the examination will be communicated to you.

Presentation Schedule Course Marking Scheme Course Overview

This course is designed to teach you the basic knowledge and skills required to understand pasture and forage crops in your locality and in Nigeria in general. This will assist you to learn how to get the most out of the natural and sown pastures available for better utilization by livestock.

How to Get the Most from this Course

You will learn faster in this course by paying attention to your facilitator during the practical class and also by participating actively in the practical. You also need to read the course material and understand it before going for tutorial lecture or practical as the case may be.

Summary

This course intends to enhance your understanding of pasture and forage crops in Nigerian agricultural system, in order to effectively managed and utilize the resources available for improved livestock performance.

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MODULE 1 CLASSIFICATION OF PASTURE AND FORAGE CROPS

Unit 1	Terminologies in Pasture and Forage Crops Production
Unit 2	Morphological characteristics of grasses, legumes and shrubs

UNIT 1 TERMINOLOGIES IN PASTURE AND FORAGE CROPS PRODUCTION

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1.0	Introduction
2.0	Objectives
3.0	Main Content
3.1	Definition of Pasture
3.2	Classification of Pasture Plants
3.3	Common Forage Crops used in Livestock Feeding
3.4	Pasture Weeds
4.0	Conclusion
5.0	Summary
6.0	Tutor-Marked Assignment
7.0	References/Further Readings

1.0 INTRODUCTION

Pasture production is paramount to the development of any livestock enterprise especially under situations where profit gain and environmental sustainability are the goals of the production. Naturally, nature has set plants to be the primary producers of energy to other animals including man. There is a direct or indirect relationship between pasture species and livestock performance depending on the management. While ruminant livestock such as cattle, sheep and goats can graze or browse the pasture, others such as pigs, poultry, rabbits and equines (donkeys and horses) have the ability to ingest some amount of fibrous forages, which ferment in the caeca and provide the animals with some energy for physiological activities.

2.0 OBJECTIVES

At the end of this unit you should be able to:

- Define pasture and forage crops
- Classify pasture plants based on their morphological structures
- Identify pasture and forage crops common to your locality

3.0 MAIN CONTENT

3.1 Definition of Pasture

Pasture can be defined in many ways depending on purpose:

- Pasture is defined as an area of land occupied with forage plant species either natural or planted by man for the purpose of providing qualitative feed to livestock at the right quantity.
- It could refer to any forage species valuable as livestock feed
- It can also refer to an act of feeding; grazing or browsing animals on pasture plants or pastures.

3.2 Classification of Pasture Plants

Pasture plants can be classified into the following:

- a) **Grasses:** These belong to the family *Gramineae*. They are characterized by high energy, low crude protein, fast growth rate, cylindrical stems and leaves. The leaves have parallel venation pattern and stem is hollow. They have fibrous rooting system with light and small seeds. Other related family members in this family include maize, millet sorghum, barley and rye.
- b) **Legumes:** These belong to three different families (*Mimosoideae*, *Caesalpinoideae* and *Papilionaceae*) depending on the nature and shape of their flowers. They have broad leaves with net venation pattern. They are herbaceous plants with flowers occurring mainly at the terminal buds. However, it is also possible to have flowers in other parts of the plant such as auxiliary branches. These flowers produce seeds in pods. Examples include *Centrosema pascourum*, *Alysicarpus vaginalis* and *Mucuna pruriens*.
- c) **Grazed Plants:** These are short herbs that are consumed with both leaves and stems together. Examples include: *Brachiaria ruziziensis*, *Sorghum almum* (Columbus grass), *Arachis pintoii* and *Digitaria smutsii*.
- d) **Browed Plants:** These are woody plants whose leaves and twigs (soft stems and buds) are eaten while the woody stem is left uneaten. e.g. *Leucaena leucocephala*, *Gliricidia sepium* and *Gmelina aborea*.
- e) **Annuals:** These are plants that complete their life cycle within one growing season and survive the dry season as seeds. e.g. *Chloris gayana*, *Brachiaria mulato II*, *Pennisetum purpureum* and *Hypherrania rufa*.

- f) **Biennials:** These are plants that complete their life cycle in two seasons. First season is for vegetative growth and second season for reproductive growth. e.g. *Panicum maximum* (Elephant grass), *Andropogon tectorum* (Southern Gamba grass) and *Cynodon dactylon* (Bermuda grass).
- g) **Perennials:** These are plants that grow throughout the year for many years producing flowers and seeds without dying such as *Gmelina aborea* tree, *Ziziphus mauritiana* tree, *Ficus thonningii* tree and *Acacia albida* tree.
- h) **Weeds:** These are non-planted plant species that invade an area by itself. e.g. *Sorghum bicolor*, *Amaranthus spinosis* and *Tridax procumbens*.

3.3 Common Forage Crops used in Livestock Feeding

The most common forage crops used in livestock feeding in Nigeria include the followings:

- Maize plant used in making silage
- Sugar Beet used in making hay and silage
- *Sorghum almum* (Columbus Grass)
- Lablab (*Lablab purpureus* L. Sweet)
- *Andropogon gayanus* (Northern Gamba Grass)
- *Andropogon tectorum* (Southern Gamba Grass)
- *Hyparrhenia rufa* (Shuchi Grass)
- *Pennisetum typhoides* cv Maiwa
- *Stylosanthes guianensis* cv Schofield stylo
- *Stylosanthes hamata* cv Verano stylo
- *Brachiaria decumbens* (Signal Grass)
- *Digitaria smutsii* (Woolly Finger Grass)
- *Giliricidia sepium* (Almond Blossom)

3.4 Pasture Weeds

When a pastureland is left unattended in terms of management practices for years, there is a tendency for weeds to invade the pasture. These weeds could be controlled manually by removing them with hand or through cutting with cutlasses. The farmer may decide to use chemicals such as pre or post-emergence herbicides at the time of pasture establishment, mainly for broad-leaved weeds. Weeds reduce the quality of pasture especially when they invade large portion of land in the pasture. They also compete vigorously with the pasture plants for space, nutrients, light intensity and moisture content. Examples of common

pasture weeds in Nigeria include: *Amaranthus caudatus* (waterleaf), *Crinum ornatum* (Lily), *Solanum incanum* (Graden egg), *Cyperus rotundus*; *Kyllinga sp.*(Nut Grass), *Cucurbita maxima-C. pepo* (Pumpkin) etc.

4.0 Conclusion

In this unit, you have learnt the definition of pasture and different classes of pasture plants. Also, the unit teaches you the common pasture plants and weeds in Nigerian pastures.

5.0 Summary

You have learnt that:

- Pasture can be defined in different ways based on the context upon which it is used
- Pasture plants are classified according to their morphological structure or life cycle
- There are many pasture plants in Nigeria depending on locality where the pasture land is situated. However, many weeds tend to invade the pastures under poor management.

6.0 Tutor-Marked Assignment

1. What is a pasture in livestock production?
2. How do the leaves of grasses differ from those of legumes?
3. Mention 3 examples each of pasture grasses, legumes and weeds

7.0 References/Further Readings

Barnes, R.F., D.A. Miller, and C.J. Nelson. (1995). Forages, the Science of Grassland Agriculture. 5th Ed., Vols. 1 and 2, Iowa State University Press, Ames, IA.

Onifade, O. S. and Agishi, E. C. (1988). A Review of Forage Production and Utilization in Nigerian Savanna. Retrieved from <http://www.fao.org/wairdocs/ILRI>

UNIT 2 MORPHOLOGICAL CHARACTERISTICS OF GRASSES, LEGUMES AND SHRUBS

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Morphology of Grasses
 - 3.2 Morphology of Legumes
 - 3.3 Morphology of Shrubs
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

Pasture and forage crops have unique characteristics that can easily be used to identify them in the field. These morphological differences have direct effect on the forage yield and quality of the plants. Animals graze the leafy parts of the plants first before other parts are eaten. This is because the leaves are more palatable and nutritious compared to the stems or branches. Studying the morphological parts of pasture and forage crops will enable us to know how to properly utilized our pasture and forage resources in Nigeria.

2.0 OBJECTIVES

At the end of this unit you should be able to:

- Identify the different parts of Grasses
- Recognize the morphological structures of legumes and shrubs
- Compare and contrast the different structures of grasses, legumes and shrubs

3.0 MAIN CONTENT

3.1 Morphology of Grasses

Grasses have two different parts. These include:

- The root
- The shoot

The root of grasses is fibrous in structure and it occurs in tussock or bunch depending on the specie. However, some grass species such as *Sorghum bicolor* may have a long fibrous rooting system that could go deep into the soil in search of moisture. The root contains small root hairs that are used for absorption of water and minerals from the soil. Generally, the roots of grasses are shallow compared to those of legumes and shrubs. Some grasses have rhizomes (underground storage organs that assist the grass to survive harsh conditions such as drought).

The shoot of grasses is divided into two parts-the stem and the inflorescence (flower). The stem is made up of the leaves, nodes and inter-nodes. The leaves are attached to the stem at the leaf sheath (a thin leathery cover that holds the leaf). The leaves of grasses have parallel venation pattern with a central mid-rib at the centre. The leaf blade is found at the edges, which could be very sharp in some species. Some hairs may be present under the leaf blade in some grass species. The inflorescence or flower is the reproductive part of the grass. It is found at the top most end of the plant. It is made up of spikes and spikelets. Other patterns of arrangement of flowers on the spike are possible. It is important to note that in some grass species, there may be many stems when the grass has stolons (structures that enable the stem to extend to other parts thereby forming a network of stems).

3.2. Morphology of Legumes

Legumes are divided into four different parts:

- Root
- Branches
- Leaves
- Flowers

The root of legumes occur as tap root system with a central tap root that penetrates deep into the soil to provide more support and absorb moisture. There are lateral roots and root hairs that function as points of entry of solutes (water and minerals) from the soil to the stem or from the stem back to the soil, through osmotic processes. Roots of legumes possess some nodules (smaller or larger swellings that house some bacterial strains that assist in fixing atmospheric nitrogen into the soil). The size of the nodule depends on the specie.

The stem of legumes is divided into smaller and larger branches, which terminate as flowers. There could be many auxiliary branches on the main stem and each could results into production of flowers. Also, the branches are subdivided into nodes and internodes.

Leaves of legumes occur in triplicate (i.e. three leaflets making one leaf). There is a central petiole that holds the leaflets together. The leaves have net venation pattern and their size depends on the species. Different arrangement of leaflets on the stem and branches is observed in the legumes.

Flowers are found to exist in two places in legumes. They either occur at each terminal buds or at the end of the branches. However, regardless of their position, they are made up of calyx (base leaves), corolla that contains the petals (not more than five), stamens (male part) and the ovules (female part). The size of the flower depends on the species but most flowers are flamboyant, with fragrance smell, which is highly attractive to pollinating insects.

3.3 Morphology of Shrubs

Shrubs have the same morphological structure with forage legumes. The only difference between them is that shrubs contain more woody stems than forage legumes and they have more leaves, flowers and seeds. Also, the height of shrubs could be up to 4 meters, unlike forage legumes whose height might be 1 meter or even less.

4.0 Conclusion

In this unit, you have learnt the differences between the morphological structure of pasture grasses, legumes and shrubs.

5.0 Summary

You have learnt that:

- Grasses are morphologically divided into fibrous root and shoot (leaves, stems and flowers).
- Legumes are divided into roots, branches, leaves and flowers
- Shrubs are like forage legumes except that they have more woody stems, leaves, and flowers and their height is up to 4 meters.

6.0 Tutor-Marked Assignment

1. Identify two grass, legumes and shrubs **each** from your locality and describe their morphological structures based on your observation.
2. How do these structures help them to survive the dry season?

7.0 References/Further Readings

Identifying Pasture Grasses, University of Wisconsin, A3637, available at website: <http://learningstore.uwex.edu/>

Identifying Pasture Legumes, University of Wisconsin, A3787, available at website: <http://learningstore.uwex.edu/>

MODULE 2 TYPES OF PASTURES BASED ON PRODUCTIVITY AND USES UNIT 1 NATIVE PASTURES

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Definition of Native Pastures
 - 3.2 Management of Native Pastures
 - 3.3 Limitations of Native Pastures
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings.

1.0 INTRODUCTION

Established Pastures are categorized into different classes for easy identification and uses. Native pastures established themselves naturally in most cases. However, livestock farmers may decide to establish them either by seed or through vegetative means. In Nigeria, native pastures are found in the natural rangelands. These pastures suffer mismanagement by users, which leads to many social problems in our societies. In this unit, you will learn some basic information about native pastures and how to manage them efficiently.

2.0 OBJECTIVES

At the end of this unit you should be able to:

- Define the meaning of native pastures
- Understand the methods of management of native pastures in Nigeria
- List some basic limitations that affect the establishment of native pastures in Nigeria

3.0 MAIN CONTENT

3.1 Definition of Native Pastures

Native pastures are otherwise known as the natural grasslands. They could be natural or derived from slashed or burnt bushes. Derived natural pastures occur when forests or bushes are cleared for crop production purposes. They may consist mainly of indigenous species or in some situations the introduced (exotic) species. Examples of natural

pastures include: *Eragrostis turgida* (Toad's wheat), *Eragrostis ciliensis* (Vomiting of a cat), *Indigofera conjugate* (Indigo), *Isobertinia doka* (Black Doka), *Hibiscus sabdariffa* (Roselle Plant), *Pennisetum pedicellatum* (Kyasuwa Grass). Native pastures are low in quality especially when harvested at late stage of growth.

3.2 Management of Native Pastures

Native pastures can be managed in different ways depending on farmer's choice. However, in Nigeria, these pastures are usually managed through various methods either directly or indirectly based on location of the pastureland. Where livestock production is considered as a serious business, management of these pasture include the following methods:

- **Grazing:** This involves the use of livestock to reduce the amount of biomass produced by these pastures within a given period of time. Livestock such as ruminant animals (e.g. cattle, sheep, goats, alpacas etc) depend on pastures to acquire the necessary energy for normal physiological activities. Therefore, grazing of native pastures by livestock help to facilitate the pasture growth and reduce the amount of water loss from the shoot. Moreover, grazing helps the pastures to utilize the sunlight energy from the sun faster through the young and fresh re-growth as a result of grazing.
- **Burning:** This is mainly done in order to eliminate the dead and lignified leaves and stems/branches that fall on top of the soil in the natural rangelands. The pasture growing in such locations are completely burnt to ashes. Thereafter, a new vegetative material comes up immediately after the first rain. Pastures will not be eliminated due to burning because they have underground stolons and rhizomes, which help them to survive such fires and also, the ash generated from the process serves as a good source of mineral nutrients to the pastures.
- **Slashing with cutlasses or mower:** This can be done either manually using cutlasses or mechanically using a mowing machine. The main idea here is that when these pastures are cut at certain height, the biomass density of the shoot reduces thereby creating more spaces for sunlight to penetrate the remaining portions left. This will make them to photosynthesize faster and deposit more carbohydrates and nitrogen for good livestock performance. Also, the livestock mainly in the form of conserved forage utilizes the pastures better. This will also help to improve farmers' income.
- **Division into paddocks or large fences demarcated with barb wires and angle irons:** This is a situation whereby the native

pastures are completely demarcated with barb wires and angle irons in order to improve the grazing efficiency of the pastures by livestock. Certain number of livestock is allowed to graze a paddock without over/under-stocking the pastures. In Nigerian situation, the fencing can be cheaply done using other materials such as *Jatropha curcas* or *Gliricidia sepium* plants. However, these plants are less effective than the barbwire fencing, although barbwire and angle irons are expensive to purchase.

- Sod seeding: This refers to the process of planting seeds of improved pastures in an existing native pastures. This can be done by some artistic designs to be decided by the manager of the rangeland or pastures. Sod seeding of native pastures is hardly done in Nigeria because the rangelands are under the jurisdiction of the government rather than individuals or communities. Sod seeding helps to improve the productivity of pastures.
- Fertilization: This involves applying organic or in-organic fertilizers to native pastures for improved biomass production and quality. Grasses require nitrogen fertilization more than legumes. This helps them to accumulate more carbohydrates and energy thereby making them better forage materials for livestock.
- Frequent defoliation: This refers to the systematic cutting of pasture species in the field through the use of a mowing machine or cutlasses. The defoliation is done frequently at fixed intervals, such as two weeks intervals etc. This will help to facilitate re-growth of the existing native pastures thereby improving their productivity.

3.3 Limitations of Native Pastures

The following limitations have been identified in native pastures:

- They have shorter growing seasons than improved pastures especially in low rainfall areas because they are adapt to the environment
- They have low nutritive values compared to improved species. This is due to the accelerated maturity as a result of high temperatures and rainfall in humid areas
- Native pastures are highly unstable due to climatic fluctuations, evolution, migration of species, weed invasion and fires

4.0 Conclusion

In this unit, you have learnt the definition of native pastures, their common examples in the rangeland, management methods and also their major limitations for utilization.

5.0 Summary

You have learnt that:

- Native pastures occur naturally without anybody's effort to raise them in the rangelands.
- They can be managed through different methods which could be determined by the farmer or farm manager only
- Native pastures are constrained by some limitations especially as regard to their growth habit and quality

6.0 Tutor-Marked Assignment

1. You and your facilitator will go to open woodland near the School and identify Gamba grass, *Pennisetum pedicellatum*, *Hyperrhenia rufa*, *Isobertinia doka* and *Cassia tora*.
2. Compare and contrast the growing habits of these native pasture species?

7.0 References/Further Readings

University of Wisconsin-Team Forage Pastures and Grazing website available at: <http://www.uwrf.edu/grazing/>

UNIT 2 IMPROVED PASTURES

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- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Definition of Improved Pastures
 - 3.2 Management of Improved Pastures
 - 3.3 Limitations of Improved Pastures
- 4.0 Conclusion
- 5.0 Summary
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- 7.0 References/Further Readings

1.0 INTRODUCTION

Improved pastures are pastures that have undergone breeding, selection and improvement for better yield and livestock performance. They differ from native pastures because they are mainly exotic or are imported from other countries. They can also be introduced from one region to another within the same country. Therefore, their management practices differ from the native species. They produce higher biomass of superior quality than the native pastures. However, the cost of establishing and maintaining improved pastures is always a cause for concern to the farmers.

2.0 OBJECTIVES

At the end of this unit you should be able to:

- State the differences between improved and native pastures
- Explain the characteristics of improved pastures in Nigeria
- Identify some basic limitations of improved pastures in Nigeria

3.0 MAIN CONTENT

3.1 Definition of Improved Pastures

Improved pastures are pastures that produce higher quality forage to livestock. These pastures could also be used for land management such as control of erosion. They could be fully sown pastures, which could be sole species pastures or mixed grass-legume pastures. Sometimes, native pastures could be over-sown with improved legumes. These pastures persist under heavy doses of artificial fertilizers, especially grass species. Therefore, mixed grass-legume pastures are better, provided

they are well adapted to the environment, adequately fertilized and not over- grazed. Examples of improved pasture species in Nigeria include: *Brachiaria brizantha* (grass), *Mucuna pruriens* (legume), *Digitaria smutsii* (grass), *Arachis pintoi* (legume) etc.

3.2 Management of Improved Pastures

Improved pastures are managed in the same way other crops are managed in the farm. The management of these pastures starts at establishment phase. The following steps are important for successful establishment and high quality biomass in these pastures:

- Selection of a fertile land for establishment
- Good and timely land preparation
- Choice of the right pasture specie
- Use of correct seed rate depending on the cost of the seeds and availability
- Use of the recommended seeding depth during planting
- Proper control of weeds
- Timely fertilization
- Defoliation/removal of shoots for forage conservation or livestock feeding

3.3 Limitations of Improved Pastures

The following limitations have been identified in improved pastures:

- They are expensive to establish and maintained
- They may not establish well in the locality where the farmer intends to establish them
- Seeds of improved pastures are difficult to acquire by farmers
- Some improved pastures are not suitable for temporary use due to their growing habits

4.0 Conclusion

In this unit, you have learnt the definition of improved pastures and their major differences with native pastures. Also, you have learnt some common examples of improved pastures in Nigeria, establishment procedures and their major limitations for utilization.

5.0 Summary

You have learnt that:

- Improved pastures produce forage of superior quality to livestock.
- They can be used for other purposes such as land management
- The agronomic procedure is the same with that of field crops
- They are however constrained by some limitations especially the cost implication

6.0 Tutor-Marked Assignment

1. You and your facilitator will visit a nearby farm with improved pasture species and identify three (3) species **each** of improved grass and legume species.
2. Why do these pasture species perform better than the native pastures?

7.0 References/Further Readings

A3637-Identifying pasture grasses. An extension bulletin of the University of Wisconsin, USA, 33pp.

Pasture quality: Principles and Management. Available at www.beeflambnz.com.

UNIT 3: PASTURES ASSOCIATED WITH CROPS

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Pastures associated with field crops
 - 3.2 Pastures associated with tree crops
 - 3.3 Ley Pastures
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

Pasture species are incorporated into other crops for optimum benefits ranging from environmental protection to other economic benefits. Both native and improved pasture species can be used for this purpose. The major advantage of this system is increase in grain and forage yield of the crops (e.g. maize crop), which could translate into improved economic gain by farmers. However, in some situations, drastic drop in grain yield may result, especially when the crop and pasture species are planted on the same land, and on the same day.

2.0 OBJECTIVES

At the end of this unit you should be able to:

- Compare the different types of associations between crops and pastures
- Describe their advantages and disadvantages
- Illustrate some examples in Nigerian farming system

3.0 MAIN CONTENT

3.1 Pastures Associated with Field Crops

Pastures are integrated into field crops such as cereal crops (e.g. maize, millet, sorghum etc). This has been an old practice in the Nigerian farming system. For example, farmers in northern Nigeria have been incorporating groundnut into millet or sorghum fields for fear of complete crop failure due to drought and expectation of higher grain yield of the cereal crop. The pasture species provide extra nitrogen to the cereal crop through biological processes. This further helps to maintain the soil health.

3.2 Pastures Associated with Tree Crops

Improved grasses and legume pasture species can be planted in plantations of coconut, oil palm, rubber and fruit trees. This will assist in replacing weeds and native pasture species common in such areas. The pasture species can be used indirectly for 'cut and carry system' of livestock feeding or directly for grazing. The following are advantages of this system

- There is higher returns from combined land use
- Increased nut recovery in coconut plantation
- Reduction in weed population
- Increase in income and financial base of farmers

However, there is a problem of competition for nutrients by both the pasture species and the tree crops. Therefore, additional fertilizers are needed to supply the required nutrients. Also, reduction in light penetration due to canopy cover may affect the pasture species grown underneath.

3.3 Ley Pastures

Pasture species are sometimes planted together with field crops. Browse plants such as *Leucaena leucocephala*, *Gliricidia sepium*, *Gmelina aborea* etc are commonly used for this purpose. The main difference between ley pastures and pastures associated with crops is that in ley pastures browse plants are mainly used as pasture species rather than other grass and legume species. These types of pastures are mainly established for temporary use and they have the following advantages:

- They help to improve soil fertility
- They help farmers to control weeds, disease pathogens and pests
- They provide fencing materials to farmers
- They help to increase yield of cereal crops
- They help to combat climate change

4.0 Conclusion

In this unit, you have learnt the different types of pastures associated with crops, their major differences and advantages.

5.0 Summary

You have learnt that:

- Pastures can be planted together with cereal, browse and tree crops in Nigeria.
- These pastures are established based on different purposes such as disease control
- Ley pastures have other advantages such as mitigation of effects of climate change on environment.

6.0 Tutor-Marked Assignment

1. What is/are the implication(s) of planting pasture species together with cereal crops on the same land and on the same day?
2. Define ley pastures and state five examples of such pastures in your locality

7.0 References/Further Readings

Ahlgren, G.H. (1949). Forage crops. McGraw-Hill Book Co., New York, NY.

Barnes, R.F., D.A. Miller, and C.J. Nelson. (1995). Forages, the science of grassland agriculture. 5th Ed., Vols. 1 and 2, Iowa State University Press, Ames, IA.

MODULE 3 TYPES OF PASTURES BASED ON DURATION UNIT 1 TEMPORARY PASTURES

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Definition of Temporary Pastures
 - 3.2 Establishment of Temporary Pastures
 - 3.3 Advantages and Disadvantages of Temporary Pastures
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

Temporary pastures are pastures that are established with the intention of converting them into farmlands after a few years. This will depend on the type of livestock enterprise the farmer wants to establish and the resources available. Also, the number of animals in the farm will influence farmer's decision to choose the number of years these pastures will be used. However, the farmer needs to be careful in choosing the right pasture species to establish to avoid environmental damage.

2.0 OBJECTIVES

At the end of this unit you should be able to:

- Understand the reasons for establishing temporary pastures in the farms
- Describe their establishment procedure
- Explain the major advantages and disadvantages.

3.0 MAIN CONTENT

3.1 Temporary Pastures

These are pastures established as part of rotation system either to provide feed for livestock or for other purposes such as control of erosion, pests and diseases or moisture conservation. They could also serve as sources of nutrients to the soil, thereby improving the fertility of the soil. Both annual and perennial species can be used but they have to be easily eradicated. They are of high productivity because they are established on good soils. They last for a period of 3-5 years.

3.2 Establishment of Temporary Pastures

Temporary pastures are established on already fertile lands that are relatively plain and not rocky. The site should be well prepared through ploughing, harrowing, leveling and ridging. The right quantity of seeds should be purchased from a reliable source, before sowing. The agronomic procedure is similar to that of establishing field crops. However, there is need for prompt fertilization and weeding especially during the first year of establishment.

3.3 Advantages and Disadvantages of Establishing Temporary Pastures

Establishing temporary pastures has the following advantages:

- The farmer could integrate livestock production into pastures
- There is less use of chemicals to control insects, pests and diseases in the farm
- The fertility of the soil improves
- They can easily be eradicated

However, the following disadvantages affect the establishment of these pastures:

- These pastures may not serve the purpose upon which they are established to achieve
- Farmers may require additional expenses to purchase fertilizers especially in grass species
- They may not withstand heavy defoliation or grazing by livestock

4.0 Conclusion

In this unit, you have learnt the meaning of temporary pastures and the advantages and disadvantages of establishing such pastures especially in specialized livestock systems, for profit gain. However, they are established on fertile lands for improved productivity.

5.0 Summary

You have learnt that:

- Temporary pastures are pastures established as part of rotation system.
- Temporary pastures do not exceed 3-5 years before they are eradicated
- These pastures help farmers to achieve their targeted profit within a short period of time.

6.0 Tutor-Marked Assignment

1. List 3 advantages and disadvantages of temporary pastures in Nigerian agricultural system
2. Are these type of pastures common in your locality? If yes/no why?

7.0 References/Further Readings

Langer, R.H.M. (1994). Pastures, their ecology and management. Oxford University Press, Auckland 3, New Zealand.

Forage and Grazing Terminology Committee (1991). Terminology for grazing lands and grazing animals. Pocahontas Press, Blacksburg, VA.

UNIT 2 SEMI-PERMANENT PASTURES

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Definition of Semi-Permanent Pastures
 - 3.2 Establishment of Semi-Permanent Pastures
 - 3.3 Advantages and Disadvantages of Semi-Permanent Pastures
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

Semi-permanent pastures are pastures that are established for a few years to cover soil and provide feed for livestock. Such pastures are converted into cropping lands after a few years. When there is a break in cropping phase, farmers find it difficult to allow the land to remain idle. Therefore, semi-permanent pastures are normally established on such lands to assist farmers to acquire more feed for livestock or receive extra income from the sale of forage.

2.0 OBJECTIVES

At the end of this unit you should be able to:

- Explain the difference between temporary and semi-permanent pastures
- Memorize their establishment procedure
- Describe the major advantages and disadvantages of these pastures.

3.0 MAIN CONTENT

3.1 Semi-Permanent Pastures

These are pastures that are established as part of rotation system usually due to a break in cropping phase. The cropping phase can be broken for several reasons such drastic decrease in prices of crops, disease outbreak, low soil fertility or change in decision by the farmer. Therefore, livestock production is integrated into these pastures for a short period of time, usually 5-10years before the pastureland is re-converted into cropping land again.

3.2 Establishment of Semi-Permanent Pastures

Semi-permanent pastures are established on fertile soils that are not waterlogged and undulating. The site should be well prepared following recommended agronomic procedures. Leguminous forages such should carefully follow plots that were previously planted with cereal crops such as *Mucuna pruriens* and vice versa.

3.3 Advantages and Disadvantages of Establishing Semi-Permanent Pastures

Establishing semi-permanent pastures has the following advantages:

- The farmer has the liberty to revert back to crop cultivation any time he/she desires
- The soil is adequately protected from direct heating by sunlight
- The soil organisms are properly conserved thereby improving the soil health
- The income level of farmers increases through sales of forage or other crops However, the following disadvantages affect the establishment of these pastures:
- Sometimes these pastures may serve as potential sources of pests in the farm
- Some may be difficult to eradicate using local implements such as hoes
- They may not established well especially when poorly managed due to competition with other crops

4.0 Conclusion

In this unit, you have learnt the difference between semi-permanent and temporary pastures and the advantages and disadvantages of establishing such pastures. However, they are established on fertile lands for improved productivity.

5.0 Summary

You have learnt that:

- Semi-permanent pastures are pastures established due to a break in cropping phase or as part of rotation system.
- These pastures do not exceed 5-10 years before they are eradicated
- These pastures may serve as sources of pests and diseases when poorly managed.

6.0 Tutor-Marked Assignment

1. Under which conditions do you think farmers should establish semi-permanent pastures in Nigeria?
2. List two consequences of these pastures in Nigerian farming systems

7.0 References/Further Readings

Langer, R.H.M. (1994). Pastures, their ecology and management. Oxford University Press, Auckland 3, New Zealand.

Forage and Grazing Terminology Committee (1991). Terminology for grazing lands and grazing animals. Pocahontas Press, Blacksburg, VA.

UNIT 3 PERMANENT PASTURES

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Definition of Permanent Pastures
 - 3.2 Establishment of Permanent Pastures
 - 3.3 Advantages and Disadvantages of Permanent Pastures
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

Permanent pastures are pastures that are established for many years (several decades) so as to provide feed for livestock. These pastures could be native or sown depending on choice. They are established in farms with large number of livestock to avoid depletion of feed during periods of scarcity. They serve as the main source of feed for grazing by livestock that are intensively managed.

2.0 OBJECTIVES

At the end of this unit you should be able to:

- Explain the meaning of permanent pastures
- Recall their characteristics and establishment procedure
- Describe the major advantages and disadvantages of these pastures.

3.0 MAIN CONTENT

3.1 Permanent Pastures

Permanent pastures are mainly established for the purpose of feeding livestock. They can be native or sown pastures. These pastures last for several decades. They consist of annual and perennial species that have underground storage organs (rhizomes and stolons). These structures help the pasture species to survive the dry season and other harsh conditions such as fire incidence, intense defoliation and overgrazing. When pasture specie is not producing viable seeds annually, such species can be used in permanent pastures. These pastures are however very difficult to be eradicated. They are planted on fertile soils. These

type of pastures are usually common in highly profitable livestock enterprises such dairy and beef enterprises.

3.2 Characteristics and Establishment of Permanent Pastures

Permanent pastures are characterized by species that contain underground rhizomes and stolons. These are storage organs that assist these pastures to survive harsh conditions. There is no need of reseeded these pastures once they are well established. They could be single or mixed species pastures. They are established on fertile soils that are not waterlogged and rocky. The site should be well prepared following recommended agronomic procedures. Once established, these pastures are difficult to be eradicated.

3.3 Advantages and Disadvantages of Establishing Permanent Pastures

Establishing permanent pastures has the following advantages:

- These pastures help to retain the structure of soils due to the underground organs
- They provide large quantity of forage to livestock
- They resist natural and human hazards such as fire outbreaks and drought
- They can easily cover a large area of land through rapid seed production
- Farmers can get extra income from sales of harvested forage

However, the following disadvantages affect the establishment of these pastures:

- They are very expensive to established and maintained
- Livestock may be forced to feed on only one pasture species without choice
- They can serve as potential hosts of some disease vectors such as snails etc.

4.0 Conclusion

In this unit, you have learnt the major characteristics of permanent pastures and the advantages and disadvantages of establishing such pastures. However, they are very expensive to establish.

5.0 Summary

You have learnt that:

- Permanent pastures are pastures established for decades.
- These pastures have some underground organs that help them to survive harsh conditions
- These pastures provide farmers with extra income from sales of harvested forage.

6.0 Tutor-Marked Assignment

1. How do permanent pastures survive dry season periods in Nigeria?
2. Mention three advantages and disadvantages of these pastures in Nigerian farming systems.

7.0 References/Further Readings

Langer, R.H.M. (1994). Pastures, their ecology and management. Oxford University Press, Auckland 3, New Zealand.

Forage and Grazing Terminology Committee (1991). Terminology for grazing lands and grazing animals. Pocahontas Press, Blacksburg, VA.

MODULE 4 PASTURES IN NIGERIAN AGRICULTURE**UNIT 1 ROLE OF PASTURES IN NIGERIAN AGRICULTURE****CONTENTS**

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Advantages of Pastures in Nigerian agriculture
 - 3.2 Constraints to Successful Pasture Production in Nigerian agriculture
 - 3.3 Interrelationship between Pastures and other Ecosystem Components
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

Subsistence farmers with very few resources and low farm outputs dominate Nigerian agriculture. However, crop-livestock integrated system is most commonly found throughout Nigeria. Although improved pastures are established only in some research institutes, universities and other private farms, majority of farmers utilize pastures from natural rangelands. Rearing animals on pastures in Nigeria helps to reduce the cost of production, since farmers pay nothing before they utilize the abundant pasture resources in Nigeria. Pastures are the backbone of Nigerian livestock industry because of their significant role in sustaining the livestock sector and Nigerian economy.

2.0 OBJECTIVES

At the end of this unit you should be able to:

- Demonstrate the significant role of pastures in the Nigerian livestock industry
- Remember the major constraints affecting pasture establishment in Nigeria
- Explain the existing relationship between the components of grassland ecosystem.

3.0 MAIN CONTENT

3.1 Advantages of Pastures in Nigerian Agriculture

Pastures have the following advantages in Nigerian farming systems:

- They help to provide feed for livestock especially during the rainy season period
- They help to protect and conserve the soil thereby preventing damages
- They are used as part of rotation system such as ley pastures
- They are used for site stabilization in dams, under bridges and in lawns etc
- They serve as sources of income to many Nigerians through sales of conserved forage
- They are used in recreational centers such as stadia, polo grounds, open spaces etc
- They serve as sources of vitamins e.g. vitamins A and B which are needed for healthy living
- Products from pasture finished livestock are higher in omega-3 and conjugated linoleic acids which help to decrease blood cholesterol level and decreases cancer risks
- They serve as a source of employment to Nigerians especially in the area of forage conservation and marketing

3.2. Constraints to Successful Pasture Production in Nigerian Agriculture

Although pasture production offer numerous advantages to Nigerian economy, but there are some challenges facing the sector, which militates against its success since 1950's to date. These constraints include:

- Climatic factors in Nigeria do not favour the production of some exotic pasture species especially in Sahelian areas of the country
- Presence of dense forests especially in southern parts of Nigeria hinder successful pasture establishment
- Lack of awareness by farmers about the importance of pasture production especially during dry season periods in Nigeria
- Lack of interest in pasture production by majority of farmers in Nigeria due to easy access to our natural rangelands
- Lack of good management of our natural rangelands
- Traditional beliefs by farmers affect the success of pasture establishment in Nigeria
- Inadequate lands due to high human population and competition

- with crops
- Use of unproductive lands for pasture production by farmers rather than fertile soils
- Lack of knowledge about pastures and their production procedures in Nigeria

3.3 Relationship between Pastures and Other Ecosystem Components

In grassland ecosystem, there are some existing relationships between various components of the system. These relationships help to maintain balance in the system, thereby providing livestock with nutritious feed. The components affected are:

- Soil
- Plants/Pasture Species
- Animals
- Man
- Climate

4.0 Conclusion

In this unit, you have learnt some basic advantages of pasture production in Nigeria and production constraints. Also, you have learnt the existing relationships between various components in the grassland ecosystem for better forage production and maintenance of ecosystem function.

5.0 Summary

You have learnt that:

- Pastures are necessary for successful livestock production in Nigeria.
- However, there are some production constraints that affect pasture production in Nigeria
- There are some relationships between the ecosystem components in grasslands.

6.0 Tutor-Marked Assignment

1. Why do you think farmers everywhere in Nigeria do not grow pastures?
2. What are the advantages of having relationships between the various components in pasture ecosystem?

7.0 References/Further Readings

Aregheore, E. M. (2009). Country pasture/Forage resource profiles of Nigeria. <http://www.fao.org/wairdocs/ilri/x5520b/x5520b12.htm>. Accessed on 19th December, 2013.

UNIT 2 FACTORS AFFECTING SUCCESSFUL PASTURE ESTABLISHMENT IN NIGERIA

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Use of Native Pasture Species
 - 3.2 Climatic and Soil Factors
 - 3.3 Socio-Economic Factors
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

There are many factors affecting pasture production in Nigeria, ranging from climatic, soil and socio-economic factors. There is a positive correlation between the amount of vegetation cover and soil moisture content. Also, the types of soil upon which pastures are grown affect their productivity. Farmers in Nigeria have different socio-economic beliefs which play significant roles in pasture establishment and utilization. Nigeria has different climatic zones with wide variations in the amount and intensity of rainfall received, hence differences in vegetation cover.

2.0 OBJECTIVES

At the end of this unit you should be able to:

- Relate the livestock industry with the use of native pasture species
- Discuss the effects of climatic and soil factors on pasture productivity in Nigeria
- Mention the existing socio-economic factors affecting pasture production in Nigeria.

3.0 MAIN CONTENT

3.1 Use of Native Pasture Species in Nigerian Agriculture

In Nigeria, majority of farmers use native pasture species instead of improved species. This is because of availability of forage in natural rangelands, riverbanks and roadsides e.g. *Amaranthus caudatus*, *Eragrostis ciliensis*, *Andropogon gayanus*, *Hyparrhenia rufa* etc,

particularly during the rainy season period. Although these species are abundant all year round, but their quality decreases progressively with advancing maturity. Therefore, they need to be over sown with improved pasture species for improved livestock performance. However, farmers have to be aware of this technology for easy acceptance and adoption.

3.2. Climatic and Soil Factors

Nigeria is endowed with different climatic zones, which support the growth of pasture species based on location. The amount of rainfall received, relative humidity (amount of water vapour in the atmosphere), environmental temperature and other weather elements such as sunshine and wind, affect pasture production in Nigeria. The quantity and quality of forage produced depend on these factors. Other factors are related to soil type, fertility and topography. Improved pasture species established on fertile soils that are relatively plain for better yield and quality.

3.3 Socio-Economic Factors

The following factors affect pasture productivity in Nigerian agricultural system:

- Overgrazing natural rangelands
- Ignorance of farmers about the importance of pasture farming
- Inadequate policies on pasture resources and improvement in Nigeria
- Fluctuating demands and supply of livestock products due to fluctuating income
- Inadequate and costly pasture seeds that are unaffordable by majority of farmers in Nigeria
- Poverty of farmers
- Lack of farmers' organizations on pasture production and marketing in Nigeria
- Insecurity issues prevent farmers from expanding their enterprises

4.0 Conclusion

In this unit, you have learnt the factors that affect pasture production in Nigeria both at small scale and commercial levels. Some of these factors are natural while others are man-made. Therefore, our livestock industry can only be modernized through successful pasture production and management.

5.0 Summary

You have learnt that:

- Native pastures dominate Nigerian rangelands and farmers rely heavily on them.
- Climatic and soil factors affect pasture establishment and yield
- There are some socio-economic factors that are related to human beliefs and lifestyle.

6.0 Tutor-Marked Assignment

1. Why do you think farmers in Nigeria depend heavily on native pastures?
2. How do climatic and soil factors affect pasture production in Nigeria?

7.0 References/Further Readings

Aregheore, E. M. (2009). Country pasture/Forage resource profiles of Nigeria. <http://www.fao.org/wairdocs/ilri/x5520b/x5520b12.htm>. Accessed on 19th December, 2013.

MODULE 5 PASTURE ESTABLISHMENT FOR FORAGE AND SEED PRODUCTION UNIT 1 STEPS IN PASTURE ESTABLISHMENT

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Pre-Planting Operations
 - 3.2 Planting Methods
 - 3.3 Post-Planting Operations
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

Some operational activities are done for successful pasture establishment. These activities are necessary because they help the pasture species to survive in a new environment, full of challenges (e.g. pests and diseases, nematodes etc). A well-managed pasture can easily adapt to the new environment perhaps due to proper soil moisture, air, nutrients and the right soil structure. However, there should be favourable climatic condition and good management practices. Badly managed pastures will poorly establish regardless of whether they are native or exotic species.

2.0 OBJECTIVES

At the end of this unit you should be able to:

- Tell the operations necessary before establishing new pasture species in Nigeria
- Analyze the pasture planting methods in Nigeria
- Recall the post planting operation for pasture establishment in Nigeria.

3.0 MAIN CONTENT

3.1 Pre-Planting Operations in Pasture Establishment

The following operations are necessary before successful pasture establishment in Nigeria:

- Site selection-This will depend on the locality upon which the pasture is to be established. However, the site should be good for cultivation of field crops, and it should be plain and not rocky
- Land clearing-This should be done either manually, chemically, mechanically or through burning. However, cost: benefit ratio of such methods should be ascertained before making decision.
- Seedbed preparation-Seed beds should be prepared through good land preparation. This can be achieved through ploughing, harrowing, leveling and construction of ridges, in case of large seeded legumes
- Seed treatment-Pasture seeds should be treated with fungicides and insecticides before planting. Sometimes, seeds are treated using hot water to break their dormancy. This process is known as scarification. Also, some pasture seeds such as *Lablab purpureus* are inoculated with rhizobium strain of bacteria to facilitate germination and establishment. However, the quantity of seeds (seed rate) to use has to be determined on per hectare basis. The sowing depth has to be shallow for grass species (2cm) and medium for legumes (5-7cm)

3.2. Planting/Sowing Methods

Pasture seeds can be planted or sown using three methods (planting, drilling and broadcasting). Planting is done mainly for large seeded legumes such as *Mucuna pruriens*, *Lablab purpureus* etc. These pasture seeds are planted using inter and intra-row spaces available (25cm×75cm) for optimum plant population. In drilling, there is no intra-spacing, rather the seeds are drilled evenly with a single and continuous hole. For broadcasting, the seeds are broadcasted in the field. Drilling and broadcasting methods are done for small seeded legume and grass seeds. Sometimes, it is advisable to use a carrier agent such as sand, fertilizer or sawdust during planting to enable seeds to be placed in the intended location, especially on a windy day.

3.3 Post-Planting Operations

After an encouraging germination of the pasture species, some operations are expected for better establishment, forage yield and quality. These operations include the followings:

- Weeding-This can be achieved manually, through the use of hand hoes, chemically using herbicides or mechanically, using tractor coupled implements such as a weeder. Weeding should be done at 2-3 weeks after planting depending on the intensity of weeds and also the management. In commercial pasture production, weeding is done mechanically for better results

- Fertilizer application- Fertilizers should be applied after weeding for improved performance. Some farmers apply fertilizers such as phosphatic fertilizers e.g. Single Super Phosphate (SSP) during land preparation. However, other fertilizers such as nitrogenous fertilizers have to be applied to the pasture especially if it is a sole grass pasture.
- Defoliation-This refers to the cutting of plant shoot with the aim of improving the growth performance and getting high quality forage. The pasture species can be defoliated 2-3 times in a year depending on the species, environmental conditions and management.

4.0 Conclusion

In this unit, you have learnt the step-by-step procedures of establishing a new pastureland in Nigeria. The three steps are necessary provided the farmer targets forage yield and quality. These steps are essentially the same with those of cultivating field crops such as maize, except some few differences

5.0 Summary

You have learnt that:

- Pastures are established using standard operational procedures.
- However, these procedures can be modified by farmers to achieve their goals

6.0 Tutor-Marked Assignment

1. Itemize the steps involved in pasture establishment in your locality
2. How can you control weeds in the pastureland?

7.0 References/Further Readings

Steve Barnhart, Dan Morrill, Jim Russell, Ken Moore, Peggy Miller, Shawn Shouse, and Charlie Brummer, rev. (2005). Pasture Management Guide for Livestock Producers, ISU PM 1713, phone: 515-294-5247, fax: 515-294-2945; email: pubdist@iastate.edu

Barnes, R.F., D.A. Miller, and C.J. Nelson. (1995). Forages, the science of grassland agriculture. 5th Ed., Vols. 1 and 2, Iowa State University Press, Ames, IA.

UNIT 2 PASTURE HARVESTING AND PROCESSING METHODS

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Growth Stages of Cutting the Pasture
 - 3.2 Moisture Reduction Techniques in Pastures
 - 3.3 Preservation Methods in Pastures
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

Pastures are harvested at certain stages of their growth for conservation and subsequent utilization during periods of feed scarcity. Pasture harvesting is necessary for better supply of high quality feed, because forage dry matter progressively decreased with advancing maturity. The quality of conserved forage depends on harvesting method and the moisture content at the time of harvest and storage. Different machineries are used in harvesting pasture species in Nigeria, due to their high efficiency compared to manual methods such as using cutlasses etc.

2.0 OBJECTIVES

At the end of this unit you should be able to:

- Recognize growth stages for cutting pastures in Nigeria
- Analyze techniques of reducing moisture in freshly cut pastures
- Discuss preservation methods in pastures

3.0 MAIN CONTENT

3.1 Growth Stages of Cutting Pasture

There are three growth stages of cutting pasture species in Nigeria:

- **Pre-Flowering Stage:** This is a stage in pasture growth in which the pasture specie has more vegetative growth before setting flowers for seed production. This period starts from early stage of growth (3weeks after planting), up to 8 or 9 weeks post

planting period in grass species. However, in legume species, the period depends on the specie and management practices applied. During this stage, there are more leaves in the shoot and the stems are not hard (lignified). The moisture content of forage at this stage is usually high with little dry matter content. Therefore, more material needs to be harvested before conserving for future use.

- **Flowering Stage:** At this stage, the pasture specie produces flowers for seed production. Fertilized ova result into immature seeds, which can be grazed by livestock or even defoliated for conservation. This stage is known as the bloom stage. The amount of dry matter at this stage supersedes the moisture content, and therefore farmers normally harvest their pastures at this stage depending on the type of enterprise.
- **Post-Flowering Stage:** During this stage, seeds are set by the pasture specie. However, the moisture content of the seeds is still high compared to dry seeds. This stage is sometimes known as the dough stage in maize plant for silage. The forage at this stage contains high level of fibre for structural support. Livestock feed very little quantity of the forage material at this stage, even though the moisture content is very low.

3.2. Moisture Reduction Techniques in Pastures

Forages are made up of water and dry matter components. The amount of these components depends on stage of growth of the forage. However, moisture remains the most important factor to be considered before using or storing any material for future use. Therefore, moisture content can be reduced from the forage by wilting the material for some few days after cutting. Thereafter, the wilted forage can be further sliced into fine, smaller cuts to facilitate moisture loss. Also, there has to be frequent turning of the forage material while in the field depending on the dimension, density and structure of the swath.

3.3 Preservation Methods in Pastures

Pastures can be preserved in many forms based on interest of the farmer. These preservation techniques include the followings:

- **Hay-** This refers to conserved forage that is in dried stage. Spreading the forage in the sun or inside barn can do the drying process either. However, sun cured hay is cheaper to make than the barn cured hay, but barn cured hay is more qualitative than sun cured hay. This is because of less leaf losses in the barn compared to the field. Hays are stored as rectangular or round

bales, cubical bales or as stacks. The quality of hay depends on the stage of cutting the forage and climatic condition.

- Silage- Silage is conserved forage that has undergone complete anaerobic fermentation for a period of 3 weeks. Fresh forage material is harvested at appropriate stage of pasture growth. The material may be allowed to wilt or used directly to make silage while the moisture content is still high. The forage has to be cut into smaller pieces before transporting into silo. A silo is a structure for making silage. After uploading the forage in the silo, it has to be well consolidated. Some additives are added in the material to facilitate intake. Finally, a polythene material is used to cover the silo completely for a period of three weeks.

Silage is more acceptable to livestock than hay because of its quality. However, it is more expensive to make than hay.

- Pellets: Pastures can also be preserved in form of pellets. This is possible by using pelletized machine after drying the forage into hay. This will facilitate packaging, easy handling and transportation of the forage from one place to the other. Also, its acceptability to livestock is higher compared to hay.

4.0 Conclusion

In this unit, you have learnt the harvesting and processing processes of pastures in Nigeria. Pastures are harvested only at certain stage of their growth depending on the type of enterprise and the goal of the farmer.

5.0 Summary

You have learnt that:

- Pastures are harvested at different growth stages for better dry matter yield
- Three processing processes are mainly used to conserve forage for future use

6.0 Tutor-Marked Assignment

1. When do you think pastures should be harvested in intensively managed dairy farms?
2. How can you prepare a good quality hay in the farm?

7.0 References/Further Readings

NRAES 173 Forage Utilization for Pasture Based Livestock Production. Available at <http://www.nraes.org/>

MODULE 6 PASTURE MANAGEMENT AND IMPROVEMENT UNIT 1 CHOICE OF SPECIES

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Choice of Pasture Specie
 - 3.2 Germination Percentage of Pasture Specie
 - 3.3 Establishment and Eradication of Pasture Specie
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

Pasture management refers to all possible activities and decisions taken by the management with the aim of improving the pasture in terms of forage yield and quality. This is particularly important because animals require pasture throughout the year, while pasture growth is restricted to certain months in a year. The major components that are considered in pasture management are the soil, plant, animals and their interactions. However, the decision on how to go about managing the pasture is solely based on manager's decision.

2.0 OBJECTIVES

At the end of this unit you should be able to:

- Describe the characteristics of the chosen pasture species
- Discuss the role of seed germination in pasture management
- Understand the importance of pasture establishment and eradication in pasture management

3.0 MAIN CONTENT

3.1 Choice of Pasture Species

The success of any pasture depends on good choice by the farmer at the beginning of establishment process. This is because there are some variations within and between pasture species. Therefore, the specie chosen should have the following characteristics:

- Should be easy to establish
- Should have high dry matter yield
- Should be of high quality in terms of crude protein content
- Should not be expensive
- Should not be dangerous to the environment
- Should be easily eradicated when the need arises
- Should be acceptable to livestock

3.2. Germination Percentage of the Specie

Pasture species are affected by environmental extremes and therefore they have to be managed well for better results. Pasture seeds vary in weight and size. However, the bigger the size, the better the germination rate and vice versa, due to food reserves in the seed cotyledon. Sometimes germination percentage can be low due to long shelf life, presence of inert materials such as stones etc, low viability, poor storage or hard seed coat. When low germination is observed, the seeds can be treated using different techniques such as scarification, for improved germination and establishment.

3.3 Establishment and Eradication of Pasture Specie

Pastures can be established either from seeds or vegetative parts such as stem cuttings. Certain desirable characters are considered in established pasture specie. These include:

- Ease of establishment
- Persistency of yield
- Resistance to drought and climatic variations
- Spread of growth period and yield distribution
- Quality of yield
- Seed production
- Ease of eradication

4.0 Conclusion

In this unit, you have learnt that chosen pasture specie is the first step in pasture management process. This is because there is variations within and between pasture species, which should be used to achieve the desired goal.

5.0 Summary

You have learnt that:

- Pastures management depends on good pasture species in the farm
- The chosen pasture specie should have good germination percentage with better establishment characteristics.

6.0 Tutor-Marked Assignment

1. Why is it important to choose good pasture specie?
2. How can you guard against poor germination of pasture seeds in the farm?

7.0 References/Further Readings

Steve Barnhart, Dan Morrical, Jim Russell, Ken Moore, Peggy Miller, Shawn Shouse, and Charlie Brummer, rev. (2005). Pasture Management Guide for Livestock Producers, ISU PM 1713.

UNIT 2 FERTILIZER APPLICATION

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Types of Fertilizers for Pasture Specie
 - 3.2 Methods of Application of Fertilizers in Pasture Specie
 - 3.3 Sources of Nutrients in Pastures
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

Fertilizers are needed in pastures for better establishment and quality. This is due to the supply of necessary nutrients (macro and micro) that are highly essential for pasture growth. Lack of these nutrients in the soil can lead to poor growth and performance of pasture species. Different pasture species have different fertilizer requirements. For example, grass species require more of nitrogenous fertilizers than phosphorus, although phosphorus is also critical to the survival of the species. Legumes need more of phosphorus and calcium rather than nitrogen.

2.0 OBJECTIVES

At the end of this unit you should be able to:

- Describe the types of fertilizers used in pasture species
- Discuss their methods of application on pastures
- State sources of nutrients in pastures

3.0 MAIN CONTENT

3.1 Types of Fertilizers for Pasture Species

There are two types of fertilizers used in pasture management. These include: -organic fertilizers or farm yard manure and chemical fertilizers. All of these fertilizer sources supply the same type of nutrients to pastures. However, the rate of release of these nutrients differed between the fertilizer sources. Organic manures are very slow in the release of nutrients compared to chemical fertilizers. Chemical fertilizers are further categorized into straight (e.g. Urea 46%N) and compound fertilizers (e.g. NPK 15:15:15) depending on the number of chemicals they contain.

3.2. Methods of Application of Fertilizers to Pasture Species

Fertilizers can be applied to pastures either during land preparation or at planting. Phosphatic fertilizers such as Single Super Phosphate (SSP) can be applied at single dose during land preparation because it is immobile in the soil. However, nitrogenous fertilizers such as urea can be applied in split doses to capture the highly mobile nitrogen in the soil. Therefore, it is advisable to apply nitrogenous fertilizers to pastures at 3 and 6 weeks after planting for better results. Fertilizers are mainly applied using broadcasting method but they can also be drilled. However, spot application is only possible in pasture species such as forage maize.

3.3 Sources of Nutrients in Pasture Species

Nutrients in pastures can come from different sources, which may include the following:

- Fertilizer application
- Urine of livestock
- Faeces/dung of livestock
- Decay of organic matter in the soil
- Atmospheric deposition e.g. SO_4^{2-} , NO_3^{2-}
- Activities of soil living organisms such as bacteria

4.0 Conclusion

In this unit, you have learnt that there are different types of fertilizers that can be applied in pastures. These fertilizers can either be applied in single or split doses and their sources can be from single or combined sources.

5.0 Summary

You have learnt that:

- Fertilizers can come from organic or chemical sources
- They all contain the same source of nutrients but the rate at which they release these nutrients vary greatly
- They can be applied at single or split doses.

6.0 Tutor-Marked Assignment

1. List 3 examples of commercial fertilizers that can be applied to pastures in Nigeria
2. What do you think should be considered before fertilizers are applied to pastures?

7.0 References/Further Readings

Wild, A. (1988). Russells soil conditions and plant growth. 11th Ed., Longman Scientific and Technical, New York, NY.

UNIT 3 DEFOLIATION OF PASTURE SPECIES

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Frequency of defoliation in Pasture Species
 - 3.2 Intensity of defoliation in Pasture Specie
 - 3.3 Morphological structure of Pasture Species
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

Defoliation is one of the pasture management practices in Nigeria. It refers to cutting of shoot of pasture species using manual or mechanical methods so as to facilitate re-growth in pastures. The newly grown forage after defoliation is more nutritious than the defoliated part. The farmer for future use will recover more forage material. However, the amount of forage to be defoliated depends on the pasture species. Some species are able to withstand defoliation while others cannot. This can be judged from the reaction of pasture species after defoliation.

2.0 OBJECTIVES

At the end of this unit you should be able to:

- Describe the idea behind defoliation in pasture species
- Discuss the effect of frequency and intensity of defoliation on pasture re-growth
- State the effect of plant morphological structure on forage yield and quality in pastures

3.0 MAIN CONTENT

3.1 Frequency of Defoliation in Pasture Species

The pasture specie can be frequently or in-frequently defoliated for better management. Frequent defoliation refers to defoliation at specific time interval such as after every two weeks. While in- frequent defoliation refers to pasture defoliation at different time interval e.g. one week, three weeks or four weeks interval. Here, there is no consistency in the time the pasture is defoliated. Frequency of defoliation is determined by the reaction of pastures to grazing or defoliation.

3.2. Intensity of Defoliation in Pasture Species

The extent to which pastures are defoliated depends on the management and growth habit of the pastures. Some pasture species are defoliated at the height of 10cm to 15cm above the soil. Others can be defoliated up to 5cm above the soil. If the pasture sward is very dense, intense defoliation is possible. However, when pasture sward is sparsely distributed, than intense defoliation is not a good management procedure.

3.3 Morphological Structures of Pasture Species

Defoliation process depends on morphological structure of pasture species. Those species that grow erect are better for defoliation using mechanical method such as tractor etc. Examples include *Brachiaria brizantha*, *Desmodium intortum*, *Andropogon gayanus* etc. Others such as *Mucuna pruriens*, *Stylosanthes hamata*, *Centrosema pascuorum* etc grow horizontally, and therefore their structure does not warrant defoliation. Rather, livestock on the field can graze them. Defoliation of such forage species is not a good option because it will facilitates leaf losses and shattering during defoliation.

4.0 Conclusion

In this unit, you have learnt that pastures can be defoliated either frequently or in-frequently. Also, the intensity of defoliation will depend on choice of the management. Anatomical structure and growth habit of the pasture species affect defoliation process.

5.0 Summary

You have learnt that:

- Defoliation of pastures can be done either manually or mechanically
- The intensity of defoliation depends on type of pasture species in the farm

6.0 Tutor-Marked Assignment

1. Differentiate between frequent and in-frequent defoliation in pastures
2. Can sparsely dense pastures be defoliated as part of management process?

7.0 References/Further Readings

Rayburn, E.B. (1987). Pasture management facts and figures for New York. Seneca Trail Resource Conservation and Development Council, Franklinville, NY.

UNIT 4 FORAGE CONSERVATION TECHNIQUES

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Hay
 - 3.2 Silage
 - 3.3 Stacked Hay
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

Forage conservation is one of the methods of pasture management in Nigeria. Excess forage is conserved during the period of abundance to be used during period of scarcity. In order to avoid excessive spending on purchase of expensive concentrate feeds, farmers harvest forages during peak period of growth and preserve in form of hay, silage or stacks. Although the quality of these conserved forages vary greatly, but they are reliable methods used in Nigerian livestock industry to address the issue of feed scarcity.

2.0 OBJECTIVES

At the end of this unit you should be able to:

- Reproduce the benefits of hay to livestock
- Memorize the difference between hay and silage as conserved forages
- Compare the three conserved forages in Nigerian livestock industry

3.0 MAIN CONTENT

3.1 Hay

Hay is dry forage formed after wilting, sun drying, turning and packaging of the dry forage material. The packaging process can be done either with a baling machine or manually using hand. Hay is the most common method of forage conservation in Nigeria. It has the following advantages over silage:

- ❖ It is easier and faster to make compared to silage
- ❖ It has high dry matter content
- ❖ It requires less labour than silage
- ❖ It is cheaper than silage
- ❖ It can be done anywhere provided the farmer is experienced
- ❖ It provides bulkiness in the rumen which aid the rumen micro-organisms

3.2. Silage

Silage is fermented forage used for supplementing livestock either throughout the year or during the period of feed scarcity. It requires high technical man power and is more expensive than hay, especially in intensively managed farms. However, it has the following advantages:

- ❖ It is more qualitative than hay
- ❖ It has high acceptability by livestock than hay provided it is well prepared
- ❖ It is independent of weather
- ❖ It can be integrated with other farm operations such as mowing and grazing
- ❖ It can smoothen weed seeds
- ❖ It can easily be degraded by rumen microbes

3.3 Stacked Hay

This refers to dry forage prepared by reducing moisture content while the forage is in the field. The difference between stack hay and hay is that stack hay is normally kept for temporary use whereas hay can be stored for years without spoiling. This type of hay is commonly seen in rural areas where farmers store hay from their crops such cowpea and groundnut haulms. It is mostly seen on top of trees and rooftops in villages and along the road. Stacked hay has the following advantages:

- ❖ It is most suitable for smallholder livestock enterprises in Nigeria
- ❖ It does not require much labour to prepare
- ❖ It requires less space than hay and silage
- ❖ It supplies livestock with the much required energy and protein during critical periods
- ❖ It is free from fire outbreak which may ravage the livestock industry

4.0 Conclusion

In this unit, you have learnt that pastures can be conserved in three forms in Nigeria. Each form has its advantages over others. However, stacked hay is the most common method of conserving forage in Nigeria, because majority of farmers are smallholders.

5.0 Summary

You have learnt that:

- Forage can be conserved in form of hay, silage and stacked hay
- Due to the peasant nature of the farmers and crop-livestock integration system, stacked hay is the most common method of conserving forage in Nigeria.

6.0 Tutor-Marked Assignment

1. Differentiate between stacked hay and silage in terms of their quality parameters
2. Which one can you recommend to Nigerian farmers and why?

7.0 References/Further Readings

Rayburn, E.B. (1987). Pasture management facts and figures for New York. Seneca Trail Resource Conservation and Development Council, Franklinville, NY.

Savory, Alan. (1998). Holistic Resource Management. Available at www.holisticmanagement.org

UNIT 5 WEEDS CONTROL

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Definition and Types of Weeds
 - 3.2 Economic Implications of Weeds in Pastures
 - 3.3 Methods of Weeds Control
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

Weeds are part of pastures especially in Nigeria where pastures are poorly managed. There are many types of weeds that can easily multiply and take over the pastures within a short period of time. Hence, weeds invade new areas of lands in Nigeria due to plant migration, invasion and climatic fluctuations. These weeds must be controlled for sustainable pasture production as well as livestock survival and strong economic base in the country. Some of these weeds are poisonous to livestock and should not be allowed to persist in pastures.

2.0 OBJECTIVES

At the end of this unit you should be able to:

- Define weeds and state their types in pastures
- Memorize the economic implications of weeds in pastures
- Compare the methods of weeds control in Nigeria

3.0 MAIN CONTENT

3.1 Definition and Types of Weeds

Weeds are unwanted plants in pastures that have not been planted by the farmer. They are of different genus and species with the pasture plants, and therefore, when allowed to grow with the selected species, they can easily adulterate the pasture. There are two types of weeds in pastures. These are:

- ❖ Narrow leaved weeds-mainly grasses
- ❖ Broad leaved weeds-mainly legumes

There is need to control these weeds before and after planting because at the initial stage of pasture establishment, the pasture species grow very slowly, while weeds grow very fast, thereby smothering the pasture species. However, it is important to note that there are weeds that are beneficial to livestock and farmers (non-toxic weeds) as against toxic weeds which cause economic loss and environmental hazards.

3.2. Economic implications of Weeds in Pastures

Weeds in pastures have serious economic implications which may affect the goal of the farm. These implications include the following:

- ❖ Weeds reduce forage yield and quality due to existing competition in the pasture
- ❖ Weeds cause serious economic losses to farmers
- ❖ Weeds reduce the lifespan of pastures
- ❖ Some weeds are poisonous to livestock and herders
- ❖ Weeds affect pasture seed quality and viability
- ❖ Some weeds serve as hosts to certain pests and diseases

3.3 Methods of Weeds Control

Weeds are controlled using different methods depending on farmer's choice and resources available. The following methods are commonly used:

- ❖ Manual method- This involves identifying weeds in pastures and physically removing them by hand pulling. They can be gathered in one place, burnt and buried.
- ❖ Chemical method- Weeds can be controlled using chemical means such as herbicides. However, there are some negative implications to the environment and farmers.
- ❖ Cultural method- This involves weeds control using biological means such as grazing livestock or other species that can eliminate the weeds through competition etc

4.0 Conclusion

In this unit, you have learnt that weeds are unwanted plants in the pasture and farmers do not plant them. They have some economic implications to the farmers. Weeds can be controlled using different methods such as manual, chemical or cultural means.

5.0 Summary

You have learnt that:

- Weeds are unwanted plants that have not been planted by the farmer
- Weeds have some economic implications on the side of the farmer
- Weeds can be controlled through many ways including manual, chemical and cultural means.

6.0 Tutor-Marked Assignment

1. Define weeds and mention 3 examples in pastures
2. What is the difference between narrow and broad-leaved weeds?

7.0 References/Further Readings

Rayburn, E.B. (1987). Pasture management facts and figures for New York. Seneca Trail Resource Conservation and Development Council, Franklinville, NY.

Savory, Alan. (1998). Holistic Resource Management. Available at www.holisticmanagement.org

MODULE 7 GRAZING MANAGEMENT SYSTEMS

UNIT 1 CONCEPT OF GRAZING MANAGEMENT

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Definition of Grazing Management System
 - 3.2 Advantages of Grazing Management System
 - 3.3 Disadvantages of Grazing Management System
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

Grazing management system involves pasture manipulation under grazing condition with the sole aim of feeding livestock and environmental control. Grazing livestock on pastures help to reduce the cost of production and improves the quality of livestock products. The type of grazing management adapted by farmers depends on resources available and management decision. However, not all grazing management systems are suitable to farmers in Nigeria, due to their costs or technical complications.

2.0 OBJECTIVES

At the end of this unit you should be able to:

- Define grazing management system
- Memorize the advantages of grazing management systems
- Recall the disadvantages of grazing management systems in Nigeria

3.0 MAIN CONTENT

3.1 Definition of Grazing Management System

Grazing management system refers to all necessary decisions taken by the manager or farmer in order to improve livestock performance under grazing condition. Such decisions may include:

- ❖ Prevention of early morning grazing of pastures to avoid diseases and pests
- ❖ Occasional checking of noxious and toxic plant species in pastures
- ❖ Defoliation of excess forage for conservation
- ❖ Supplementation of concentrates and mineral licks
- ❖ Provision of watering points in the pastures
- ❖ Fencing of pasture paddocks to maximize output
- ❖ Careful utilization of pasture resources to avoid feed deficit etc

3.2. Advantages and Disadvantages of Grazing Management Systems

Grazing management systems have some advantages and disadvantages to the farmer, livestock and the environment. The advantages of grazing management system include the following:

- ❖ It helps to improve livestock performance in terms of live weight gain, milk yield etc
- ❖ It facilitates easy control of livestock by the farmer
- ❖ It reduces the risk of theft through rustling etc
- ❖ It assists in making management decisions concerning the farm
- ❖ It helps to combat certain pests and disease vectors in the pasture e.g. snails
- ❖ It helps to minimize pasture loss through trampling and fouling by livestock
- ❖ It helps to encourage pasture re-growth through defoliation and grazing
- ❖ It helps to boost farmer's income and financial stability of the farm
- ❖ It encourages the proliferation of organic farms and products in Nigeria

3.3 Disadvantages of Grazing Management Systems

There are some disadvantages of grazing management system in Nigeria. These include:

- ❖ Cost implication of fencing and general maintenance of paddocks is high
- ❖ Some soil related diseases are difficult to control such as Nematode infections
- ❖ The technical knowledge required for successful execution of grazing systems is lacking by farmers in Nigeria
- ❖ Some grazing systems require the use of electricity which is lacking or expensive in Nigeria

- ❖ Majority of farmers are subsistence as such the output cannot pay for the huge amount of money spent in setting such structures e.g. paddocks
- ❖ Movement of livestock is restricted to the area in paddocks only. This may affect their health
- ❖ Animals are also forced to feed on only one type of pasture species in intensively managed farms

4.0 Conclusion

In this unit, you have learnt the definition of grazing management system in pasture production. You have also learnt some advantages and disadvantages of grazing management system.

5.0 Summary

You have learnt that:

- Grazing management system is a system of managing the pasture through careful grazing in order to meet livestock requirement throughout the year
- There are many advantages of grazing management systems provided it is done accordingly
- However, some disadvantages of the system are also encountered especially under bad management.

6.0 Tutor-Marked Assignment

1. Define grazing management system.
2. Mention 2 advantages and disadvantages of the grazing management system

7.0 References/Further Readings

University of Wisconsin Extension Grazing Resources and Research
bolsite: Available at <http://fyi.uwex.edu/grazres>

Hodgson, John. 1990. *Grazing Management: Science into Practice*. New York: Longman Scientific and Technical, 203 pp.

UNIT 2 TYPES OF GRAZING MANAGEMENT SYSTEMS

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Zero Grazing Management System
 - 3.2 Semi-Intensive Grazing Management Systems
 - 3.3 Intensive Grazing Management Systems
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

There are many grazing management systems adapted by farmers in Nigeria and elsewhere. These systems are further categorized based on the size of livestock owned by farmers and the area of land for grazing. Where the land is scarce, such as in cities and urban areas, grazing of livestock is rarely possible, because of traffic and human inconveniences. Therefore, farmers adopt other means of feeding their livestock to suit the condition they found themselves.

2.0 OBJECTIVES

At the end of this unit you should be able to:

- Define zero grazing management system
- Explain the semi-intensive management systems
- Differentiate the intensive and semi-intensive grazing management systems

3.0 MAIN CONTENT

3.1 Zero Grazing Management System

This is a grazing management system that is mostly common in urban and peri-urban areas of Nigeria where forage materials are cut and brought to housed animals for feeding. It is sometimes referred to as cut and carry system. It has the following advantages:

- ❖ It saves labour in grazing livestock
- ❖ It saves costs and time of the farmer
- ❖ Farmers determine the type of forage to be fed to livestock

- ❖ It helps to clear roadsides and natural rangelands from excess forages during rainy season
- ❖ It helps to facilitates re-growth of forages

It may however, have some disadvantages. These include:

- ❖ Livestock are forced to feed on only one type of feed provided
- ❖ There may be problem of forage rejection or low intake by livestock
- ❖ Sometimes it may be laborious especially when the distance is far away from the farm

3.2. Semi-Intensive Grazing Management Systems

These are grazing management systems in which livestock are allowed to have access to pasture for a very long time during the day before they are returned to their pens. Examples of these grazing systems are- continuous and deferred grazing management systems. The advantages of this system of grazing management include the following:

- ❖ It helps to improve the quality of livestock products e.g. milk yield etc
- ❖ It gives animals the liberty to exercise in the pasture
- ❖ It helps to distribute urine and dung evenly in the pasture
- ❖ It facilitates the growth of desirable pasture species
- ❖ It helps to conserve natural rangelands and pasture resources
- ❖ They are cost effective to the farmer

The main disadvantage of this system is that livestock may be exposed to the problem of toxic pasture species which are undesirable in the pasture.

3.3 Intensive Grazing Management Systems

These are grazing management systems in which livestock are completely prevented from grazing outside the farm. These systems are highly efficient in terms of outputs but are expensive to establish. Examples of these systems include- rotational grazing, strip/rationed grazing and straight creep grazing systems. The following advantages are recognized in these systems:

- ❖ Increased livestock productivity
- ❖ Increased income level to farmers
- ❖ Reduction of mortality of young animals
- ❖ Easy control of livestock by the herder
- ❖ Easy identification and control of diseases and disease vectors

However, the following are some disadvantages of these systems:

- ❖ Movement of livestock is restricted to the area in paddocks only. This may affect their health
- ❖ They are very expensive to establish by farmers
- ❖ Animals are also forced to feed on only one type of pasture species in intensively managed farms.

There are many types of grazing management systems. However, farmers in Nigeria practice not all these systems. These include the following:

- ❖ Zero grazing/Cut and carry system-This involves cutting the pasture from the field and feeding it to livestock in their pens.
- ❖ Continuous grazing system-This system involves keeping the animals in pasture for grazing throughout the year.
- ❖ Deferred grazing system- In this system, some parts of the pasture are prevented from grazing by livestock until certain times of the year
- ❖ Rotational grazing- This involves grazing livestock in paddocks for certain number of days before they are move to another paddock
- ❖ Strip grazing system-In this system, livestock are allowed to graze an area demarcated with electrical strip. Animals are lightly shocked when they touch the strip
- ❖ Straight Creep grazing system-This involves a creep area for young animals and a base pasture for the dam or mother. It is done to improve growth of young animals
- ❖ Forwards Creep grazing system-This involves the use of base pasture for animals with high nutrient requirements e.g. young animals first, before others
- ❖ First and Last Suizers grazing system-This system considers different classes of livestock for grazing at the same time e.g. cattle, sheep and goats

4.0 Conclusion

In this unit, you have learnt the definition of zero grazing management system, its advantages and disadvantages. Also, semi-intensive and intensive management systems of grazing are mentioned. However, farmers in Nigeria do not practice some of these systems.

5.0 Summary

You have learnt that:

- Zero grazing management involves cutting the forage material by farmers to feed livestock in their pens
- There are some advantages and disadvantages of semi-intensive and intensive grazing management systems
- Grazing management systems are many but in Nigeria, only few systems are practiced

6.0 Tutor-Marked Assignment

1. Define zero grazing management system
2. Mention 4 examples of such system in Nigeria and elsewhere.

7.0 References/Further Readings

University of Wisconsin Extension Grazing Resources and Research
blogsite: Available at <http://fyi.uwex.edu/grazres>

Hodgson, John. 1990. Grazing Management: Science into Practice. New York: Longman Scientific and Technical, 203 pp.