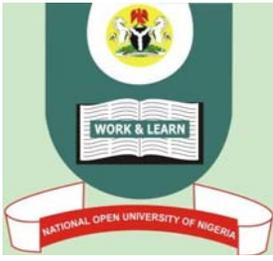


AEM 722: RUMINANT ANIMALS





NATIONAL OPEN UNIVERSITY OF NIGERIA

AEM 722: RUMINANT ANIMALS

COURSE GUIDE



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Introduction

Ruminant Animals is a first semester course. It is a year one credit unit diploma course available to all students offering Post Graduate Diploma in Agricultural Extension and Management. It may also be taken by students who wish to know more about Agricultural Extension and Management.

The course will consist of sixteen units which consists of Course Guide. Importance of ruminant animals in Nigeria, digestion in ruminants, classes of ruminants, feeding and management of sheep and goats, housing, measures for disease prevention, diseases and parasites of small ruminants and cattle breeds, management of beef and dairy cattle as well as meat and milk processing and preservation.

This course guide tells you briefly what the course is about. What course materials you will be using and how you can work your way through these materials. In addition, it suggest some general guidelines for the amount of time you are likely to spend on each unit of the course in order to complete it successfully.

It gives you guidance in respect of your Tutor Marked Assignments, which will be made available in the assignment file. There will be regular tutorial classes that are related to the course. It is advisable for you to attend these tutorial sessions.

What you will Learn in this Course

The main aim of Ruminant Animals is to acquaint you with Livestock that are referred to as ruminant animals. The different classes of ruminants will be explained, their feeding, management diseases and disease control will be examined as well as their breeding management.

The course will expose you to the different types of house and equipment used for different animals as well as the processing of animals products. The course will prepared you for the challenges you will meet in the field of agricultural extension and management.

Course Aims

The aims of the course can be summarized as follows:

To give you an understanding of the management of ruminant animals. This will be attained by aiming at:

- ➔ Defining what ruminant animals are
- ➔ Classifying ruminants into their various groups
- ➔ Discussing the feeding, breeding and management of each group
- ➔ Highlighting the diseases that can affect each group and how these diseases can be controlled.
- ➔ Discussing the processing and preservation of these animals and their products

Course Objectives

To achieve the aims set out, the course has a set of objectives. Each unit has specific objectives which are usually included at the beginning of a unit. You should read these objectives before you study the unit. You may wish to refer to them during your study of the unit to check on your progress. You should be sure that you have followed the instructions in the unit.

Below are the comprehensive objectives of the course as a whole. By meeting these objectives, you should have achieved the aims of the source as a whole.

On successful completion of the course you would be asked to:

1. Explain what Ruminant Animals are:
2. State the important of each Ruminant Animals in the Nigerian livestock sector
3. State the various classes of livestock that fall under small ruminants
4. Discuss the origin and domestication of each class.
5. Describe the breeds of each class
6. Be able to explain how to breed each of the ruminant
7. Successfully raise any of the young ruminant animals to weaning
8. Manage matured animals on the farm
9. Control diseases and parasites of these animals on the farm
10. Construct suitable housing for ruminants
11. Know the various equipment needed in each house
12. Process and store any of the ruminant animals

Working Through this Course

To complete this course you are required to read the study unit, read the set books and read other materials which may be provided by the National Open University of Nigeria.

Each unit contains self-assessment exercises and at certain points in the course you would be required to submit assignments for assessment purposes. At the end of the course there is a final examination. The course should take you about 17 weeks in total to complete. Below you will find listed all the components of the course. What you have to do and how you should allocate your time to each unit in order to complete the course on time and successfully.

Course Materials

The main components of the course are:

1. Course Guide
2. Study Units

3. References
4. Assignments
5. Presentation schedule

Study Units

The study units in this course are as follows:

- Unit 1: Introduction to Ruminant Animals
- Unit 2: Digestion in Ruminant
- Unit 3: Small Ruminants
- Unit 4: Goats
- Unit 5: Feeding and Breeding management of sheep and goats
- Unit 6: Small Ruminant Housing
- Unit 7: Measures for Disease Prevention
- Unit 8: Disease and Parasite of Sheep and Goats
- Unit 9: Importance and Classification of Cattle
- Unit 10: Cattle Breeds
- Unit 11: Management of Dairy Cows
- Unit 12: Milking Process
- Unit 13: Milk Processing and Preservation
- Unit 14: Management of Beef Cattle
- Unit 15: Meat Processing and Preservation
- Unit 16: Disease and Parasites of Cattle

The first unit focuses on the definition of non-ruminant and the examples of animals classified as ruminants. The second, third and fourth units centers on the different classes of small ruminants. For each class its origin and domestication has been discussed. Breeds belonging to each class are described as well as the breeding of these animals.

Unit five deals with feeding and breeding management of sheep and goat. The different houses that can be constructed for sheep and goats as well as the equipment necessary in a sheep and goat farm. Units 7 and 8 deal with measures of disease prevention and how to control some disease in the farm.

Unit 9 focuses on the importance and classification of cattle. This unit looks at the origin and distribution of cattle.

Unit 10, 11 and 12 deals with other aspects of cattle production such as breeding and the various classes of cattle, as well the management of dairy cows and milking of dairy cows.

Unit 13 focuses on milk processing. This unit covers the various methods of milk processing and preservation.

Unit 14 and 15 deal with meat processing and preservation as well as disease control.

Each unit consist of one to two weeks work and include an introduction, objectives, reading materials, exercises, conclusion, summary, tutor marked assignment (TMAs) and marking scheme, references and other resources. The unit directs you to work on exercises related to the required reading. In general this exercise questions you on the material you have just covered or required you to apply it in some way and thereby, help you to gauge your progress and to reinforce your comprehension of the material. Together with tutor-marked assignments, these exercises will assist you in achieving the stated learning objectives of the individual units and of the course.

Assessment File

There are eight assignments in this course. The eight assignments will cover:

- (1) Definition of non-ruminant animals and the significance of each in the Nigerian livestock sector, as well as the digestion process in ruminants (Units 1 & 2)
- (2) The origin, domestication and breeds of sheep and goats (Units 3 & 4)
- (3) Small ruminant housing and feeding and breeding management of sheep and goats (Units 5 & 6)
- (4) Measures of disease prevention and disease and parasite of sheep and goats (Units 7 & 8)
- (5) Importance and classification of cattle breeds (Units 9 & 10)
- (6) The management of diary cows and milking process (Units 11 & 12)
- (7) Milk processing and preservation and management of beef cattle Meat Processing and Preservation and Disease Control in Cattle (Units 13 & 14)
- (8) Meat Processing and Preservation and Disease control in Cattle (Units 15 & 16)

Presentation Schedule

Your course materials give you important dates for the early and timely completion and submission of your tutor marked assignments and attending tutorials. Do remember that you are required to submit all your assignments by the stipulated time. You should guard failing behind in your work.

Assessment

There are three aspects to the assessment of the course. First are self-exercises, second are the tutor-marked assignments and third is a written examination.

You are advised to be sincere in attempting the exercise. In tackling the assignments, you are expected to apply information, knowledge and techniques gathered during the course.

The assignments must be submitted to your tutor for formal assessment in accordance with the deadlines stated in the presentation schedule and the assignment file. Work you submit to your tutor for assessment will count for 50% of your total course mark. At the end of the course, you will need to sit for a final examination of about three hours duration. This examination will count for 50% of your total course mark.

Tutor-Marked Assignment (TMAs)

There are eight hours tutor-marked assignment in this course. You only need to submit five of the eight assignments. You are encouraged, however, to submit all eight assignments in which case the highest five of the eight marks will be counted. Each assignment counts 10% towards your total course mark.

Assignments questions for the units in this course are contained in the assignment file. You will be able to complete your assignment from the information and materials contained in your reading, references and study units. However, it is desirable in all degree level of education to demonstrate that you have read and researched more other references which will give you a broader view point and may provide a deeper understanding of the subject.

When you have completed each assignment, send it, together with a TMA (Tutor Marked Assignment) form to your tutor, make sure that each assignment reaches your tutor on or before the deadline given in the presentation schedule and assignment file. If for any reason, you cannot complete your work on time, contact your tutor before the assignment is due to discuss the possibility of an extension. Extension will not be granted after the due date unless there are exceptional circumstances.

Final Examination and Grading

The final examination for Ruminant Animals will be 3 hours duration and has a value of 50% of the total course grade. The examination will consist of questions, which will reflect the type of self-testing, practice exercise and tutor marked problems you have previously encountered. All areas of the course will be assessed.

Use the time between finishing the last unit and sitting for the examination to revise the entire course. You might find it useful to review your self-test, tutor marked assignments and comments on them before the examination. The final examination covers information from all parts of the course.

Course Marking Scheme

The following table shows how the actual course marking is broken down.

Assessment	Marks
Assignments 1-8	<i>Eight Assignments. Five marks of the eight count at 10% each – 50% of course marks.</i>
Final Examination	<i>50% of overall course marks</i>
Total	<i>100% of course marks</i>

Table 1: Course marking scheme.

Course Overview

This table brings together the units. The number of weeks you should take to complete them and the assignment that follows them.

S/N	COURSE GUIDE	ACTI VITY	END OF UNIT
1	<i>Introduction to Ruminant Animals</i>	<i>1</i>	<i>Assignment 1</i>
2	<i>Digestion in Ruminants</i>	<i>1</i>	<i>Assignment 1</i>
3	<i>Small Ruminants</i>	<i>1</i>	<i>Assignment 1</i>
4	<i>Goats</i>	<i>1</i>	<i>Assignment 2</i>
5	<i>Feeding and Breeding management of sheep and goat</i>	<i>1</i>	<i>Assignment 2</i>
6	<i>Small Ruminant Housing</i>	<i>1</i>	<i>Assignment 3</i>
7	<i>Measures for Disease Prevention</i>	<i>1</i>	<i>Assignment 3</i>
8	<i>Disease and Parasite of sheep and disease and goat</i>	<i>1</i>	<i>Assignment 4</i>

9	<i>Importance and classification of cattle</i>	<i>1</i>	<i>Assignment 4</i>
10	<i>Cattle Breeds</i>	<i>1</i>	<i>Assignment 4</i>
11	<i>Ruminant Housing and Equipment</i>	<i>1</i>	<i>Assignment 5</i>
12	<i>Management of diary cows</i>	<i>1</i>	<i>Assignment 6</i>
13	<i>Milking Process</i>	<i>1</i>	<i>Assignment 6</i>
14	<i>Milk Processing and Preservation</i>	<i>1</i>	<i>Assignment 7</i>
15	<i>Management of Beef Cattle</i>	<i>1</i>	<i>Assignment 7</i>
16	<i>Disease and Parasite of Cattle</i>	<i>1</i>	<i>Assignment 8</i>

Table 2: Course Organizer

How to Get the Most from this Course

In distance learning, the study units replace the unit lecturer. This is one of the great advantages of distant learning. You can read and work through the specially designed study materials at your own pace and at a time and place that suit your best. Think of it as reading the lecture instead of listening to a lecturer. The same way that a lecturer might send you some reading to do. The study units tell you when to read your other materials. In addition, just as the lecturer might give you on in-class exercise, your study units provide exercise for you to do at appropriate point.

Each of the study unit follow a common format. The first item is an introduction to the subject matter of the unit and how a particular unit is integrated with the other unit and the course as a whole. Next is a set of learning objectives, which enable you to know what you should be able to do by the time you have completed the unit. You should use these objectives to guide your study. When you have completed the unit, you must go back and check whether you have achieved the objective. If you make a habit of doing this you will significantly improve your chances of passing the course. The main body of the units guides you through the required reading from other sources. This will usually be either from a Reading section or some other sources. Self-assessment test (exercises) are interpreted throughout the units and answers are given at the end of the units. Working through these tests will help you

to achieve the objectives of the unit and prepare you for the assignments and the examination. You should do each self-tests as you come to it in the study unit. There will also be numerous examples given in the study units. Work through these when you come to them too.

The following is a practical approach for working through the course. If you run into any trouble, telephone your tutor. Remember that your tutor's job is to help you. When you need help do not hesitate to call and ask your tutors to provide it.

- (1) Read this course guide thoroughly
- (2) Organize a study schedule, which is most convenient for you. Refer to the course overview for more details.

Note the time you are expected to spend on each unit and how the assignments relate to the units. Visit information e.g details of your tutorials and the date of the first day of the semester will be made available. You need to gather together all this information in one place, such as your diary or a wall calendar. Whatever method you choose you should decide on and write your own dates for working each unit.

- (3) Once you have created your own study schedule do everything you can to stick to it. The major reason that makes students to fail is that they get behind with their course work. If you encounter any problem with your schedule, please let your tutor know before it is too late for help.
- (4) Turn to unit 1 the introduction and objectives for the unit.
- (5) Assemble the reading materials. Information about what you need for a unit is given in "time overview" at the beginning of each unit. You will almost always need both the study unit you are working on and one of your references on your desk at the same time.
- (6) Work through the unit, the content of the unit itself has been arranged to provide a sequence for you to follow. As you work through the units you will be instructed to read sections from other sources. Use the unit to guide your reading.
- (7) Well before the relevant schedule date's check your assignment file and make sure you attend to the next required assignment keep in mind that you will learn a lot by doing the assignments carefully. They have been designed to help you meet the objectives of the course and therefore will help you pass the examination. Submit all assignments not later than the schedule date.
- (8) Review the objectives for each study unit to confirm that you have achieved them. If you feel unsure about any of the objectives, review the study material or consult our tutor.
- (9) When you are confident that you have achieved a unit's objectives, you can then start on the next unit. Proceed unit by unit through the course and try to space your study so that you can keep yourself on schedule.

- (10) When you have submitted an assignment to your tutor for marking, do not wait for its return before starting on the next unit. Keep to your schedule. When the assignment is returned, pay particular attention to your tutor's comments. Both on the tutor-marked assignment form and also written on the assignment. Consult your tutor as soon as possible if you have any questions or problems.
- (11) After completing the last unit, review the course and prepare yourself for the final examination. Check that you have achieved the unit objectives (listed at the beginning of each unit) and the course objectives (listed in the course guide)

Tutors and Tutorials

Are 16 hours provided in support of this course., you will be notified of the dates, times and location of these tutorials as well as the names and phone number of your tutor as soon as you are allocated a tutorial group.

Your tutor will mark and comment on your assignments, keep a close watch on your progress on any difficulties you might encounter and provide assistance to you during the course. You must mail your tutor-marked assignment to your tutor before the schedule date (at least two working days are required). They will be marked by your tutor and returned to you as soon as possible.

Do not hesitate to contact your tutor by telephone, e-mail and discussion board if you need help.

The following might be circumstances in which you would find help necessary. Contact your tutor if :

- You do not understand any part of the study units or the assigned readings.
- You have difficulty with the self-test or exercises
- You have a question or problem with an assignment or with the grading of an assignment.

You should try your best to attend the tutorials. This is the only chance to have face to face contact with your tutor and to ask questions which are answered instantly. You can raise any problem encountered in the course of your study. To gain the maximum benefit from course tutorials prepare a question list before attending them. You will learn a lot from participating in discussing actively.

Summary

Ruminant Animals is a course that intends to introduce to you the ruminant animal and its importance in Nigeria. Upon completing this course, you will be equipped

with the basic knowledge of the nature, scope, principles and techniques of feeding, breeding, management, housing, diseases and their control, processing and storage as well as marketing ruminant animals., You will be able to answer these kind of questions:

What do Ruminant Animals mean?

Give examples of some ruminant animals

What are the importance of ruminants in Nigerian livestock sector?

How can you classify the different breeds of ruminant animals according to their classes?

What are the basic principles of breeding and feeding management of different ruminants?

Why is it necessary to house non-ruminant animals?

What are the basic principles of housing?

Are the various diseases and parasites affecting ruminants and their control?

How would you process and store animal products?

What are the marketing channels available to farmers?

How would you describe the ruminant digestive process?

Of course the list of questions that you can answer is not limited to the above list. To gain most from this course you should try to apply the principles you have learnt to the management of these animals in your local environment,

We wish you success in the course and hope that you will find it both interesting and useful. We hope you will enjoy your acquaintance with NODLP.

GOOD LUCK

AEM 722: RUMINANT ANIMALS

COURSE DEVELOPMENT

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NATIONAL OPEN UNIVERSITY OF NIGERIA

Unit 1

INTRODUCTION TO RUMINANT ANIMALS

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1.0 Introduction

This unit gives you a basic knowledge of what Ruminant Animals are, and the role they play in the Nigerian livestock sector. Some common terminologies use in describing cattle, sheep and goats will be defined in order to give you a clear understanding of the course.

1.1 Objectives

By the time you have completed studying this unit you should be able to:

- (i) Define clearly what a ruminant is, and differentiate it from other classes of livestock
- (ii) Highlight the major importance of ruminants animals in the Nigerian livestock sector
- (iii) Be conversant with common terminologies used in discussing the various ruminants animals

1.3 Definition of Ruminant Animals

Ruminant Animals are animals having four compartment stomach namely, rumen, reticulum, omasum and abomasums. They are animals capable of ruminating or chewing curd.

1.4 Difference Between Ruminants and other Animals

Ruminant Animals are animals that have evolved over time to have specially adapted digestion tracts help them survive on coarse herbage. Most of the carbohydrate that is stored in plant material is the form that cannot be digested by simple stomach animals (mono-gastrics). This is due to the presence of B-links which joined cellulose together. Ruminant animals on the other hand have micro-organisms (bacteria, protozoa and fungi) living in the rumen and reticulum. These micro organisms can breakdown the B-links to release energy in the form of valuates fatty acids (VFAs). This is very close symbiotic relationship from which both the microbes and ruminant animal benefit. The micro-organisms profit by being in a warm, controlled environment where they receive a constant supply of nourishment. The animal gains by receiving the waste products from the micro-organisms, by receiving some food which has been predigested and by having a supply of both living and dead micro-organism in its digesta which are also a source of nutrients.

The four chambered stomach enable the ruminant have extra space. This acts as a series of vats which stores food and allow fermentation by the micro-organisms.

Examples of ruminants are: cattle, sheep, goats, llama and alpacas and buffalo. For the purpose of this course we will concern ourselves mainly with cattle, sheep and goats.

Students Assessment Exercise 1.1

Apart from Sheep, Goats and Cattle, what other ruminants do you know.

1.4.1 Role of Ruminant Animals in Nigerian Agriculture

Ruminant occupy a very important place in the Nigerian livestock sector.

1.4.2 Sources of Meat of The 51 Million Heards of Different Classes of Ruminant Animals

Contribute about 85% of the total national meat supply, while in Africa sheep and goat contribute about 14% of the total meat supply. In Nigeria the contribution of small ruminants (sheep and goats to the nations meat supply is much higher than this representing about 35% of the nation meat supply.

1.4.3 Sources of Milk

It is estimated that there are about 220 million diary cows in the world producing about 430 million tones of milk per year. Africa is said to produce about 10-30% of this amount, out of this amount 14% comes from sheep and goat. In some African countries sheep and goat milk is a major source of milk supply for consumption.

1.4.4 Hide and Skin

Apart from food supply, ruminants also provide hides and skin. Leather from ruminants in the past was a major source of foreign exchange. The famous Moroccan leather is obtained from the skin of red Sokoto goat. Developing countries in Africa like Nigeria are not major producers of wool or hair. Africa produces about 37,000 tones of greasy wool per year. This represents only about 1% of world population. Sheep skin are used for clothing in the highland area of Ethiopia and Nigeria.

1.4.5 Draught Power

Cattle is a very important source of farm power in Nigeria and in different part of the world. This is accessible to peasant farmers who can't afford mechanized farm power. It has greatly reduced dependence on mechanized farm power which is very costly. It has enhanced the volume of crop production in the area of use. Bullocks are the preferred type. Cattle are also use locally for transport.

1.4.6 Manure

Ruminants are well as other animals soil fertility. Farm manure which consists of animal faecal materials in used to fertilize farm lands. Manure from tethered sheep and goats is collected and spread in crop fields as fertilizer.

1.4.7 Social Functions

Ruminants are a source of prestige to farmers. It represents the position of the owner and the family in the society. Ruminant animals are seen as a measure of status of the owner in the society as mobile banks by nomads as insurance against crop failure by mixed farmers and as items of religious worship and marriages by various groups of traditionalists.

1.5 Common Terms Used In Ruminants Animal Production

1.5.1 Cattle

Bull:- A matured male bovine (cattle or buffalo)

Cow:- A matured female bovine that has given birth at least once

Calf:- Young cattle buffalo of either sex

Heifer:- A young female cattle that is yet to give birth

It is closer to maturing than a female calf. Steer – A young male cattle that has been castrated before maturity.

Stag/Bullock – A male cattle that is castrated after maturity.

Veal - Meat from young cattle that has not been exposed to any other food except cow milk.

Beef:- Meat from cattle

Parturition:- All giving birth (calving)

Hide:- Bovine skin

1.5.2 Sheep

Ewe:- Female sheep which has lambed

Ram:- Adult male sheep, usually used for breeding

Lamb:- Young sheep usually under 9 months or before weaning

Cull:- Ewe that us removed from the breeding flock because it is old, unproductive or unwanted

Maiden Ewe:- Adult female sheep that has not been mated

Ginmmer:- Female sheep aged 6 months (or from weaning) to the first lambing

Ewe Lamb:- Female lamb

Ram Lamb:- Male lamb

Hogg, Hogget:- Sheep aged 6 months to 2 years

Weather:- Castrated male sheep, older than 6 months

Mutton:- Meat from matured sheep

1.5.3 Goat:

Buck:- A matured male goat

Doc:- A matured female goat

Chevon:- Meat from Goat

Kidding:- Act of giving birth

Mohair:- Hair obtained from a breed of goat

Cashmere:- Fine sort hair obtained from cashmere goat

Students Assessment Exercise 1.2

Give different terms for *Paturation* in cattle, sheep and goats

1.6 Digestion in Ruminant Animals

Digestion is defined as the series of processes by which the mixture of complex materials found in food is broken down to small fragments that can be absorbed and used by the animal. The gastro-intestinal tracts acts as a tube starting from the mouth and ending in the anus. In places the tube is widened to form chambers. There are also side chambers which can empty secretions into the main part of the gastro-intestinal tract. The wall of the tube is an important part of the mechanism, of digestion because all the materials the animal gets from its food is absorbed through it.

There are two types of digestion in the ruminants.

1.7 Microbial Digestion (Digestion in the Fore-Gut)

Microbial digestion occurs in the fore-gut (rumen, reticulum and omasum). The rumen and reticulum accounts for about 70% of the volume of the entire gastro-intestinal tract. The rumen and reticulum is only separated by a fold in the wall without any specific orifice joining the two chambers because of this, these two chambers are often referred to as the reticula-rumen. Food materials from the esophagus enters the rumen at the junction of the rumen and reticulum. As a result of these hard objects or foreign bodies such as stones, nails are collected.

1.8 Conclusion

This unit serves as a general introduction of what ruminant animals are: These class of animals play an important role in the Nigerian livestock industry.

1.9 Summary

You have studies what Ruminant Animals are, their importance and certain terminologies that applies to the different ruminants you will be studying in this course.

1.10 Tutor-Marked Assignment

- (i) Name the four chambers of a ruminant stomach
- (ii) List five importance of Ruminants
- (iii) What is a buck

1.11 References and other Resources

Charray J. Humbert, J.M. Levif J. 1991, Manual of sheep Production in the Humid Tropics of Africa. Redwood Press Ltd. Melksham

Devendra, C. MCleroy, G.L. 1982, Goat and Sheep Production in the Tropics, Longman, London

King J.O.L. 1978. An Introduction to Animal Husbandry. Blackwell Scientific Pub. Britain

Answers to Student's Assessment Exercise

S.A.E. 1.1:

Other Ruminants are:

- Buffalo
- Itama
- Alpaces

S.A.E. 1.2:

Different terms of Paturition

- Cattle - Calving
- Sheep - Lambing
- Goat – Kidding

RUMINANT ANIMALS

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2.0 Introduction

In this unit you will be studying about the digestion process in the ruminant. The ruminants have a digestive system that is quite different from the monogastric animals. In fact the nature of the ruminant digestion process from the basis of what you will be studying in subsequent units where feeds materials and the feeding of sheep/goats and cattle are treated.

2.1 Objectives

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

- explain clearly the nature of ruminant digestion
- distinguish between fore and hind gut digestion
- list the end products of microbial digestion
- distinguish clearly the difference in the digestion process of a young ruminant and an adult ruminant
- highlight the advantages and disadvantages ruminants have over non-ruminant animals.

2.2 Digestion in Ruminant Animals

The rumen consists of pillars, rhythmic contraction of these pillars causes the rumen to contract and expand leading to a mixing of its contents. The rumen content is made up of a more liquid part at the bottom and a dense floating “raft” of solid, mainly fibrous materials. It is this dense floating fibrous materials that the ruminant is seen further chewing (regurgitating). The act of regurgitation reduces the particle size of the fibrous materials there by increasing surface area for attack by the micro organisms in the rumen and reticulum.

2.3 Carbohydrate Digestion in the Rumen

The first micro-organism to attack food in the rumen is the fungi. Secretes enzymes that break down the surrounding fibres thereby reducing the physical strength of food particles and allow the entry of bacteria and protozoa. The rumen is an anaerobic (oxygen free) environment under this condition the protozoa and bacteria secrete enzymes that can breakdown the B-linkage in forages and 1 other fibrous feed materials to produce pyruvic acid (pyruvate) which is further broken down (Oxidized) to produce volatile fatty acid (VFA). The major fatty acids produce in the rumen are acetyl acid, propionic acid and butyric acids. Others are valeric, and iso-butyric obtained from microbial metabolism of protein. The VFA produced from the incomplete digestion of carbohydrate is absorbed through the rumen wall. You should note that the energy produced during an aerobic fermentation is lower than what is produced under aerobic (dependent on oxygen) fermentation where the end product is carbon dioxide and water.

2.4.1 Protein Digestion in the Rumen

Some of the protein consumed by the ruminants may escape microbial fermentation in the rumen and pass unchanged into the abomasums. Some of these proteins that get into the abomasums which can be digested by the normal enzymic digestion that takes place in the abomasums is extremely important in ruminant nutrition and has been given various names such as “By Pass Protein”, “Rumen Escape Protein” Rumen Undergraduate Protein (RUP)”. The fraction of dietary proteins that is degraded in the rumen is referred to as rumen degraded protein (RDP). The end product of the digestion of RDP are simple amino acids, ammonia and some urea.

Digestion leaves the reticula – rumen through the reticula – omasum orifice to the omasum. The major role of the omasum in the absorption of large volume of water coming together with the digesta.

2.4.2 Digestion In The Hind-Gut

Once the digesta enters the abomasums it is subjected to a series of changes through the action of enzymes that is similar to what happens in the simple stomach of the monogastric animal.

2.4.3 Digestion In The Young Ruminant

Ruminants are not born with rumen. At birth, the rumen and Reticulum together account for about 30% of the volume of the 4 chambers, By the age of 2 months this would have increased to about 70% and in mature cow the rumen and reticulum together occupy 85% of the volume. The abomasums on the other hand will have reduced from 70% to 7% of the volume.

In the young ruminants, feeding solely on the dam's milk the fore-gut digestion does not occur. Rather milk is passed straight from the oesophagus to the rumen through the oesophageal groove. This groove is formed as a result of a reflex action of the young ruminant which is initiated by the act of suckling. This is an important aspect of the nutrition of a young calf as milk is not subjected to microbial fermentation which reduces the quality of milk. As the animal matures and begins to nibble on grasses and other solid feed materials however, the animal loses this ability to close the groove and the rumen begins to develop to what eventually obtains in the adult.

Student's Assessment Exercise 2.1

What is the full meaning of VFA
List the components that make up VFA

2.5 Advantages of Ruminant Digestion Process.

- i. The presence of the microbial population in the rumen has a marked effect on the nutrient metabolism of the host. The microbial population allows for effective utilization of fibrous materials particularly cellulose through the action of protozoa and bacteria that can break down the β -linkage in cellulose.
- ii. Micro-organisms are also able to make use of certain feed components to synthesize other essential nutrients. Example of this is the use of non-protein Nitrogen (NPN) by ruminants to synthesize cellular proteins.

This reduces the dependence of high quality protein by ruminants and allow the use of compounds like urea to serve as protein use.

- iii. Micro-organism in the rumen can produce all B-complex vitamin. As a result they do not need to be supplied in the feed. This is with the exception of vitamins A,D and E.

2.6 Disadvantages of Ruminant Digestion Process

Most dietary protein are degraded to ammonia then to microbial protein. In some cases the microbial protein is lower in quality compared to the dietary protein. This therefore results in wastage.

Simple sugars such as glucose and starches are completely broken down to volatile fatty acids. While these acids are readily used by the animal tissues, they are used less efficiently for energy than the original carbohydrates.

During the fermentation process, as much as 4-10% of the energy consumed is converted to methanic and hydrogen gasses which the animal cannot utilize and is wasted as a result of microbial fermentation.

Students Assessment Exercise 2.2

What do you understand by the term “By pass protein.”

2.7 Conclusion

The digestion process in a ruminant animal is a complex activity involving the breakdown of fibrous materials by micro-organism leaving in the rumen in a symbiotic relationship with the animal. It is therefore not necessary to provide ruminants with all the feed nutrients because some of it can be synthesis through the action of these micro-organisms.

2.8 Summary

This unit attempts to give a brief overview of the digestion process in ruminants animals. The difference in the process of digestion as well as the anatomied difference of the stomach of young ruminants have been outlines. The presence of microorganisms in the rumen and their advantages or disadvantages to the host animal has been treated.

2.9 Tutor Marked Assignment.

What are the advantages and disadvantages of the ruminant digestion process.

2.10 References And Other Resources

Charray J.M., Levif J. 1992. Manual of sheep production in the Humid Tropics of Africa. Redwood Press. Ltd. Melksham.

Devendra, C., Mcleroy, G. L. 1982. Goat and sheep Production in the Tropics, Longman. London.

King J. O. L. 1978. An introduction to Animal Husbandry. -Blackwell Scientific Pub. Britain.

Unit 3

SMALL RUMINANTS

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3.0 Introduction

In this unit you will be studying about sheep and Goats otherwise referred to as small ruminants. Since most of these features, reproductive pattern and management practices of sheep and goats are similar, we shall be studying them together where there are differences that need to be mentioned particularly, your attention will be drawn to such areas.

Small ruminants (sheep and goats) are a major source of livelihood in many areas of Nigeria. Unlike cattle, they are owned even by poorer sectors of the community, attempts to increase the productivity of small ruminants is an important route to improving the standard of living of the rural poor and landless peasants.

3.1 Objectives:

By the end of your studying this unit, you should be able to:-

- known the origin and history of domestication of sheep and goats.
- State the importance of small ruminants as it relates to other ruminants,
- Describe the criteria use for classifying sheep and goats
- Describe the Nigerian indigenous breeds of sheep and goats.

3.2 Origin and History of Domestication

3.3 The sheep

All domesticated sheep are included in the genus *Ovis Aries*.

There are 4 major species of wild sheep. These are:

- Moufflon (*O musimon*) mostly found in European and Western Asia.
- Urial (*O orientalis*) found around Afghanistan to Western Asia
- Argai (*O ammon*) found around central Asia
- Bighorn (*O Canadensis*) found in Northern Asia and north America.

It is believed that the first 3 wild species have contributed to the make up of the present day sheep.

Sheep and goats invade the first ruminants to be domesticated between 10,000 and 6000 BC. About one fifth of the world's sheep are found in the tropics. The sheep population has increased by about 13% during the last decade. Nigeria has about 22million sheep.

3.4 The Goat

The domestic goat belongs to the genus *Copra*. This includes 3 species:-

- The bezoar (*C aegagrus aegagrus*)
- The ibex (*C aegagrus ibex*)
- The marcher (*C aegagrus falconer*)

The domestication of goat is said to have occurred in the mountainous area of Western Asia around 9,000 – 11000 years ago. The goat is possibly the earlier domesticated animal after the dog.

The bezoar goat is considered to be the major ancestor of this present day goat.

Goats represent about 15% of the total world domesticated ruminants population. They perform best in the drier tropics and on lighter sandy soils. In Africa, the highest goat population is found in East Africa, Morocco and Northern Nigeria. Nigeria has about 34 million goats.

3.5 Advantages of small ruminants over other ruminants in the supply of meat.

In comparison to the world's average of 6% Nigerian small ruminants contribute about 33% to the nation's meat supply.

3.5.1 High reproductive rate

Small ruminants have a high fertility rate and high prolificacy ranging from 120 -135%. Twinning rate is generally high in goats up to 55 -60% while that of sheep is about 20 – 22%. Estrus cycle and estrus period are short about 18 days. Estrus period ranges from 24 – 48 hours up to 72 hours. These are generally shorter in yearlings. Estrus occurs all year round in the tropics. Kidding/lambing interval is about 8 months while generation.

Interval is about 2 years. In cattle calving interval is 2 years while generation interval is about 4 years.

3.5.2 Less food needed

Because sheep and goats are ruminants they eat low quality food, particularly fibrous vegetation which cannot be eaten by humans and non ruminant animals such as poultry and pigs.

3.5.3 Products in manageable quantities.

- i. The finished product from sheep and goat provide less storage problems hence they are suitable for rural communities with low level of technology.
- ii. The meat and milk produce from small ruminants can be consumed within a day the problem of cold rooms for storage is therefore eliminated.

3.5.4 Less risk of total loss to arable farmers

In Sahelian countries, drought has demonstrated the greater resistance of sheep and goats over cattle. Small ruminants have survived such conditions and been able to make up for the meat shortage caused by cattle losses. To the traditional arable farmer, small ruminants offer security of continued food supply during periods of crop failure.

3.5.5 Low initial cost.

The raising of small ruminants is less capital intensive. While up to 70% of production cost in the monogastric go to feed the small ruminants can be completely raised on browse, pasture and agricultural waste product. The cost of sheep is much less than the cost of cow and a small holder may be able to afford to have one or two ewes but not a cow.

3.5.6 No Cultural barriers.

There are almost no cultural barriers against keeping sheep and goats or eating the meat. In contrast Muslims and Jews do not keep pigs nor eat pork and Hindus do not slaughter cattle. Poor people as well as rich people own sheep and goats whereas it is usually only the rich who own.

Students Assessment Exercise 3.1. state 5 importance of small ruminants over other ruminants.

3.6 Classification of sheep and Goats

Several methods of classification of sheep and goats have been advocated based on origin, utility, body size, ear shape and ear length and function. Each of these has its special attributes and limitation.

Based on body size using height at withers as the criterion, there are, 3 categories of sheep in Nigeria:

3.6.1 Large long legged long tailed breeds.

3.6.2 Medium size breeds

3.6.3 Short legged short tailed breed.

Table 3.1: Shows the sized classification of sheep and goats.

Table 3.1: Size classification of sheep and goats.

Classification	height at (cm) withers	Life weight (kg)
Large breeds	> 65	30 – 65
Medium breeds	50 – 65	19 – 37
Small or dwarf breeds	< 50	18 - 25

3.7 Nigerian Breeds of sheep.

There are 4 major breeds of sheep in Nigeria that fall into these 3 groups.

Large long legged long tailed breed.

This group contains two breeds. The first is:-

3.7.1 Balami

This breed of sheep has also been called the Bororo various times because it is associated with the people of Borno tribe.

Balami is the dominant sheep breed the features.

It is big predominantly white with a convex facial profile. Ears large and droopy, the tail is thin and long. Males have horns while horns are absent in females. Matured males have dewlap. Balami is a fast growing animal with a good potential for milk production. (About 3-5 kg) for singles, 2.5 -3.5kg for

twins). Weaning weight of 18kg is possible at 12weeks of age. Yearling weight is 35-45kg for ewe and 45 -60kg for rams.

Its ability to survive under arid conditions is a character peculiar to this breed and can be exploited in the utilization of non arable lands.

3.7.2 Uda (Ouda)

Also called the Fulani or Bali-Bali. This breed is found throughout the sahel and savanna zones of tropical Africa. The cost colour is black or brown in front and white behind. They are large in size with matured males measuring up to 84cm height at withers. The breed is long legged, thin and long tailed with a moderately long, floppy ears males carrying horn which could be large emerging sideways and slightly backwards with a Taoist mature rams weight 55kg while females weigh 45kg. This breed thrives best in hot dry environment it is particularly adapted to extensive grazing and is known for its trekking ability. Uda its suffers poor survival outside domain medium size breed.

3.7.3 Yankasa.

This is perhaps the most numerous and widely distributed Nigerian breed of sheep. Yankasa is found throughout the sahel, Sudan and guinea savanna zones. It is intermediate between large long legged uda and Balami and short legged West Africa Dwarf. The breed has a typical white cost colour with black patches around the eyes ears and muzzle and sometimes the feet. Ewes may have pass around the neck. Males have horns which is curved. Matured rams weigh 30 – 45kg and ewes 25 – 30kg.

3.8 Short legged short tailed breed

3.9 West African Dwafst sheep.

Also called Fouta Djallon, the forest shwvp, Djallonke. This breed is found in the whole area of the forest belt. Colour ranges from all white, all black or brown to spotted black or brown on white coat. The breed strives well in its area of occurrence which is known to be infected with tsetse fly hence the assertion that's the breed is trymo-tolerant.

Matured females have tassels while matured males have spiral or crescent shaped horns and a heavy mane. The breed has a slow growth rate, maturity and cessation of growth is between 18 – 24months. The breed is highly

prolific and incidence of twinning is high (55– 58%) matured females weigh 20 -25kg and matured males weigh 20 m- 30kg.

What has been described so far are the indigenous breeds of sheep found in Nigeria. There are very many breeds of sheep in the tropics and elsewhere. In the are sheep have shown a remarkable adaptation to local environment. In the humid parts of west Africa where Tse-tse fly is common sheep have developed tolerance to trypanosomiasis by the evolvement of the west Africa Dwarf sheep. In the middle East and eastern Africa sheep have fat tails which are food reserve to lost through the dry season.

There has also been same selection by man for the kinds of animals he prefers. This has been extensively carried out in the developed countries there are therefore specialized breed for milk or wool production. In general however, there has been little deliberate selection and there is often much variation within local breeds with respect to both appearance and productivity.

For more information onbreeds of sheep you can read Payne (1990) and Catenly (1991).

STUDENT’S ASSESSMENT EXERCISE 3.2

State that some of the Criteria used in classifying small Ruminants.

3.9 Conclusion

You have studied the origin and domestication of small ruminants. Small ruminants play vital roles in the rural communities where they help to raise the living standard of the poor and kindles peasants. Several breeds are available which have been shown.

Answers to Student’s assessment Exercise.

S. A. E. 3. 1.

Five Advantages of small Ruminants are:-

- Low initials cost
- No cultural Barriers
- Source of product is in manageable quantity
- High reproductive rate
- Little Feed is needed.

Some Criteria use for classifying small ruminants

- Origin
- Utility
- Body size
- Ear shape and length
- Remarkable adaptation to the environment which farmers can choose from.

3.10 Summary

Sheep and Goats originated from Asia and the first ruminants to be domesticated. Being small when compared to cattle, small ruminants occupy a unique position in the livestock sector. For the purpose of classification several criteria have been proposed each with its limitations. Body size and height at withers has been used to classify sheep breeds in this unit.

3.11 Tutor Marked Assignments.

Describe a named Nigeria indigenous medium Sized Breed Sheep.

3.12 *References and Other Resources*

Charray J. Humbert, J.M. Levif J. 1992 Manual of sheep Production in the Humid Tropics of Africa. Redwood Press Ltd. Melksham

Devendra, C. MCleroy, G.L. 1982 Goat and Sheep Production in the Tropics, Longman, London

King J.O.L. 1978. An Introduction to Animal Husbandry. Blackwell Scientific Pub. Britain.

Unit 4

GOATS

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4.0 Introduction

In the previous unit we have studied the origin and domestication of goats. This unit will treat the classification and breeds of goats emphasis will be placed on Nigerian goat breeds. A brief mention of some goat breeds found in other places will however be made.

Interest in the values of goats as domestic livestock is presently widespread. This is as a result of the recognition of their role in food production, their economic importance in the topics and the fact that they constitute an important component of traditional farming systems.

4.0 In this Unit you are expected to know about

- The population and distribution of goats
- The importance of goats
- Be conversant with the Nigerian indigenous goat breeds
- Other important breeds of goats

4.0 Population and Distribution of Goats

About 94 percent of the total world goat population is found in the developing countries. Africa accounts for about 32.9 percent. Within Africa, large populations of goats are found in Nigeria. Ethiopia, Somalia and Sudan. These four countries accounts for the percent of the total goat population in the Africa continent.

Nigeria has about 34 million goat. Most of which are found in Sahel, Sudan and Guinea Savanna Zones of the country. The dwarf goats are however adapted to the humid tropics.

4.1 Importance of Goats

Goats are multi-purpose animals, producing meat, milk, skin and hair. Their primary function is meat production, although in temperate countries milk has become of greater importance.

4.1.1 Source of Meat

Goat meat is relished in all countries where there is a tradition for meat consumption from both sheep and goats. Meat from goats is divided into 3 categories:

- Cabrito meat from goats 8-12 weeks of age
- Meat from young goats 1-2 years of age

- Meat from old goats 2-6 years of age

The first type of meat is very popular in Latin America and the Caribbean. The second category is possibly the most widely produced while the third group generally produces tougher meat.

Presently the demand for goat meat is in excess of supply. This has contributed to high price of the meat and live animals.

4.1.2 **Source of Milk**

Goat milk is widely consumed where ever it is produced. It is usually consumed fresh recent goats milk is being processed into other products. Goat as a supplier of milk serve a most useful function in producing valuable animal protein for rural community. For the peasant farmers and the average family who are unable to maintain a cow or a buffalo, the goat justifies its designation as “the poor man’s cow”.

4.1.3 **Source of Hair and Skin**

The skin of the maradi (Red Sokoto) goat in Nigeria is well known for its superior quality and the premium it commands in world markets, equally. well known is the Mubende skin from Uganda. Hair from goats are extensively used in making bags, ropes and carpets.

4.1.4 **Source of Income**

To rural house-hole, nomadic and semi-nomadic pastoralist goats offer employment and are a major source of ready income to meet daily cash needs.

4.1.5 **Security**

To the traditional arable farmer, small ruminant offer security of continued food supply during periods of crop failure. Other contribution of goats include the prestige inherent in their ownership and their place in custom, religion and testive occasions. Of recent goats have been used as experimental animals. Much of what is known today about milk fat synthesis and the physiological mechanism that are involved relates to the goat on account of its convenience in research.

Goats also assist in the economic utilization of non-marketable crop resources, adding to them.

Students Assessment Exercise 4.1

List the importance of goats in Nigeria

4.2 Breeds of Goats

There are approximately 300 breeds and types goats in the world, the majority of which are found in the tropics and sub-tropics. Of these, Epstein (1971) distinguished about 70 breeds and varieties in Africa Masaon (1981) Deventra and Burns (1983) have reviewed most of the important breeds of goats. For further information on breeds you are advice to refer to these references.

For the purpose of this unit we shall study mainly the Nigerian goat breeds. Special mention will however be made on the role of some European breeds in the tropics.

4.2.1 Nigerian's Indigenous Goat Breeds**4.2.1.1 Sahel/Desert Goat**

This breed is common in the arid or Sahel region in Nigeria. The breed is medium to large in size, long legged, covered with coat of short fine hair. The breed is highly adapted to nomadic life and wide range of vegetation in desert to semi-desert condition. It is tolerant of hot, dry environment but unsuited to humid regions. Many produce grade skins. All are used for meat and skin production, and a few can be described as good milker. Ears are short, males are horned. There is little information on fertility, but indications are that it may be lower than in the West African Dwarf goat.

4.2.1.2 Maradi (Red Sokoto) Goat

This is one of the few well defined breeds of goat in Africa. It is the most numerous goat breed in Nigeria originally confined to the Niger Republic and Sokoto province but has originally spread throughout the Savannah and forest belt. Ears are short and carved horizontally both sexes are horned, it is uniformly dark red in colour. The legs are shorter than the Sahel breed. The skin of the maradis is among the most valuable of all goat skins. The breed is a good meat animal. In Niger it is commonly milk yielding about 0.5kg in dry season and up to 1.5kg in wet season. Birth weight varies from 1.0 – 2.5kg. It is relatively small animal; at maternity (23 – 30 kg).

4.2.1.3 West Africa Dwarf Goat

This breed is confined to the tropical forest belt of Southern Nigeria and other West African countries such as the Cameroun. They are of small size and short legged hardly higher than 50cm height at withers. These breed has a variety of goat colour but black and brown colours predominate. Mature females have tassels. It is not uncommon for both mature males and females to have beard. The breed is rated high for its hardiness and tolerance to trypanosomiasis. The breed is highly prolific with a high percentage of twinning and triplets.

4.3 Some Important Goat breeds in the tropics

4.3.1 Nubian Goat

This breed is associated particularly with the Sudan but is now widespread in North-East Africa and the Mediterranean Coastal belt. This is the only African breed specialized for milk production. The Nubian is a large, long-legged with long pendulous ears and a pronounced Roman nose. Horns are present in both sexes in some strains, but absent in others. Some strains are predominantly black, others brown. Height at withers is about 70 – 80cm mature live-weight is 27-60kg. Milk yield ranges from between 1-2kg daily or 120-140kg annually in two locations.

4.3.2 Boar Goat

This breed is mainly found in South Africa of recent it has been intensively selected for colour pattern and meat conformation. Improved boars are white with red head markings fertility is high and good milk yield. The boar goat resembles the Nubian goat in having lop ears and convex nose. They are very hardy under tropical or sub-tropical condition but are not suited to humid regions. Milk yield is average.

4.3.3 Saanen

This breed originated from Swaziland. The breed is polled, ears are erect and forward pointing. They are very good milker Saanen breed are essentially a dairy breed. The Saanen is particularly vulnerable in environments where there is no shade and poor nutrition. Daily milk yield of 3.3kg/day have been obtained. An increasing number of this breed is found in Australia, Kenya, India, Israel and Venezuela.

4.3.4 Angora

The Angora goat originated in Central Asia and was introduced into South Africa and the United States. Angora thrives best in hot, dry sub tropical climates. Although they are bred mainly for the mohair, meat and milk and subsidiary products. Angora goats are found to be hardy and well adapted to the local conditions. The breed has a slow growth rate and poor carcass conformation. Angora is completely covered with white mohair.

Students Assessment Exercise 4.2

Describe an important Dairy Goat found in the tropics.

4.4 Conclusion

Goats are regarded essentially as tropical species. Their number and distribution have shown that goats have the widest ecological range. Many of the breeds have not been accurately described or have been described only superficially. Present knowledge about the value of many breeds and types is therefore limited.

4.5 Summary

Goats have a wide ecological distribution in Nigeria spreading from the Sahelian Zone in the North to the humid coastal belt in the Southern part of the country. There are three major breeds of goats indigenous to Nigeria. World wide, there exist very many other breeds.

4.6 Tutor Marked Assignment

- Briefly discuss the population and distribution of goats
- Describe in details the Red Sokoto Goat

4.7 *References and Other Resources*

Charray J. Humbert, J.M. Levif J. 1991 Manual of sheep Production in the Humid Tropics of Africa. Redwood Press Ltd. Melksham

Devendra, C. MCleroy, G.L. 1982 Goat and Sheep Production in the Tropics, Longman, London

King J.O.L. 1978. An Introduction to Animal Husbandry. Blackwell Scientific Pub. Britain

Answers to Students Assessment Exercise S.A.E. 4.1

The importance of Goats in Nigeria are:

- Source of Meat
- Source of Milk
- Source of Hair and Skin
- Source of Income
- Serve as Security to Farmers

Answers to Students Assessment Exercise S.A.E. 4.2

An important diary goat found in the tropics is the Nubian Goat

- This breed is common in the Sudan Region
- Only Africa breed specialize for milk production
- It is a long-legged breed
- Long pendulous eyes
- Roman Nose
- Coat colour could be black or brown
- Height at withers is about between 70-80cm
- Mature live-weight is between 27-60kg
- Milk production ranges between 1-2kg daily

Unit 5

SHEEP / GOATS

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5.0 Introduction

In this unit you will be studying feeding and breeding management of small ruminants.

Poor nutrition is one of the major factors limiting the productivity of indigenous ruminants in Nigeria. In order to develop a viable ruminants industry, animals should be fed properly. Though sheep and goats being ruminants feed mainly on roughage (grasses, legumes, browse etc). It is necessary to give them supplements in order to improve their production. Proper management of the breeding flock improves productivity and reduces kid/lamb mortality.

5.0 Objectives

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

- Properly feed the different classes of sheep and goats.
- Know the importance of flushing and steaming up as a management practice in small ruminants.
- Manage the different phases of your breeding flock.
- Raise the kid/lamb from birth to weaning.
-

5.0 Feeding

Feeding of small ruminants depends the age of the animal, physiological state of the animal (lactation, pregnancy) and the quantity of the roughage being fed.

5.1 Feeding of Adult Animals

Hay or crop residue should be provided always in addition 1-2kg. Animal/day of legume hay e.g. groundnut haulms, beans pod, cowpea residue. Animals at this stage need feed for maintenance. It is therefore not necessary to over feed them.

5.1.1 Feeding of pregnant sheep/goats

In addition to supply of hay, a farmer should feed good quality legume hay at the rate of 1.5 -2.5kg/Animal/day or concentrate can be fed at a daily rate of 200 – 300kg/Animalday. But higher levels of feeding can be maintained, especially during the last month of pregnancy when the foetus grows very rapidly and causes an increased demand on the mother's food supply. Good feeding results in the following.

- Provides nourishment for the developing foetus and usually results in a strong kid/lamb at birth.
- Good feeding enhances the development of the udder and ensure adequate milk production of the dow/ewe.
- It builds up body reserves of flesh on dow/ewe.
- It prepares the dam for the difficult task of parturition.

This practice of enhanced feeding just before parturition is referred to a steaming up.

5.1.2 Feeding of Nursing or Lactating Females.

This group of animals can be fed like pregnant females but the level of feeding should be slightly increase.. This is to ensure that the dam produces enough milk for feeding the offspring. In addition, hay and concentrate supplement should be provided at the rate of 300 -500 gm./Animal/day.

Adequate feeding of lactating does/ewes increases he survival rate of he kid/lambs

Increases the resistance of diseases of the young-ones and ensure a fast growth rate.

5.1.3 Feeding of Growers

A supplement of 0.5 – 1kg legume hay/Animal/day in addition to free choice feeding of roughage is sufficient for this class of animals.

5.1.4 Feeding of Breeding Males

When males are not in service, they should be maintained on good grazing or crop-residue ad lib plus 1-2kg legume hay/Animal/day.

About a month to being used for service, they should be place on good grazing or crop residue plus 300gm of concentrate mixture. This practice of enhanced feeding prior to breeding is referred to as flushing.

This has the following advantages.

- In males it increases the quantity and quality of semen produced..
- In females it increases the number of ova shade.
- Ensures a greater chance of turning/triplets in the dam.
- Increases the conception rate.

Care should be taken to prevent the overfeeding of the male as this will lead to fattening which is not desired in breeding males.

Students assessment Exercise S.AE.5.1

List the advantages of steaming up in small ruminants.

5.2.1 Breeding Management of Sheep and Goats.

The reproductive activity of sheep and goats is stimulated by variations in the day length. In Northern hemisphere, where day length varies with the season of the year, oestrus takes place mostly from July to October as opposed to the tropics where there is only little variation in the length of day and the oestrus cycle reoccurs through the year.

Does/ewes come on heat (oestrus) at regular intervals of about 18-21 days if not bred (Oestrus cycle). The oestrus period (the only period the female can accept the male)last for about 3 days or 72 hours.

5.2.2 Signs of Oestrus

- Uneasiness
- Frequent urination
- Tail shaking\
- Swollen Vulva with a little mucus discharge.
- Sometimes the female could be seen mounting other animals themselves.
- Bellowing

5.2.3 Mating Methods

There are two main mating methods in sheep and goats.

5.2.4 Natural Service

This involves the natural copulation of the buck/ram to a doe/ewe. In Nigeria where most females and males are kept tog ether there is no restriction to mating, Where females are kept separately from males, careful observation particularly in the early morning should be carried out to notice females on heat so as to breed them..

5.2.5 Artificial Insemination

This has recently been given more attention but is rarely practiced in Nigeria because;

- There are no enough semen banks
- Lack of chemicals for large semen preservation e.g. solid nitrogen.
- Lack of enough proven males.
- No adequate technical known-how.

5.3 Management of Breeding Does/ewes

The management of breeding females is divided to three main phases.

5.3.1 Dry period (period between weaning to gestion)

This usually last about three months. The doe or ewe is least productive at this period. It is a time the dam recovers from the stress of the previous pregnancy and lactation. It is also a time when the dam prepares for the next pregnancy period, ewe/does should be given a higher plane of nutrition.

Flushing results in a higher/lambing percentages.

For mating the ratio of buck/ram to does/ewes is 1:20- 40.

Hand service (isolating females on heat and introducing them to males) can increase the number of females to 50 under intensive management.

5.3.2 Pregnancy (gestation) period.

This refers to the period between successful mating to parturition) in sheep and goats this period is about five months.

Foetal development in the first three months of pregnancy is normally slow hence to make appreciable increases in feed supply. In the last four to six weeks prior to parturition and quality of the feed given should be increase. This is done in order to meet the nutrient requirement of the foetus as well as the dam. This enhanced feeding at period (just before parturition) is called steaming up. Steaming up ensures the following:

- Greater development of udder tissues and high milk yielding potential for the dam.
- Low doe/ewe and kid/lamb mortality.
- Higher live weight gain in the young thus heavier adult stock.

Water and Minerals should be provided ad lib.

5.3.3 Signs of kidding/lambing.

- Uneasiness i.e. restlessness
- The animals is constantly standing up. Sitting down and smelling the ground.

Udder Enlargement.

There is a significant change in the size of the udder close to parturition.

Lack of interest in grazing

The female appears not to show any interest in grazing and legs behind the flock.

The vulva appears slightly swollen with some mucus discharge.

When the female is in the process of parturition it should be allowed privacy Assistance should only be given when there are obvious signs of difficulty at which time a veterinarian should be invited.

5.3.4 Lactation period

Feeding of the lactating is aimed at increased milk production to meet the need of the offspring. Normally the feed requirement of a lactating female is greater than during pregnancy.

5.4 Management kids/Lambs

The dam should be allowed to suckle kid/lamb immediately after birth. This is because at this time the dam's milk contains colostrums. Colostrum contains antibodies which help to confer initial immunity to the kid/lamb, it also stimulates the alimentary system. Colostrum production ceases around the third or fourth day after parturition.

It is important to check the test of the female to ensure that milk is available for the kid/lamb. If the dam's milk supply is low, the kid may have to be fed with alternative milker replaces or placed with a foster mother.

G.V.. should be applied to the cut naval of the young to prevent infection.

Weaning can be done between 4 weeks to 3months depending on age breed and purpose. However, weaning below the age of 3 month is not advisable for tropical sheep and goats. Weaning can be encouraged by the provision of creep feed. The young animal normally begins to nibble at solid food such as leaves. Grasses at 2-3 weeks of age.

Where a dam dies immediately after parturition artificial colostrums should be provided.

Artificial colostrums is made up of:

- 0.61 litre of cow's milk
- 1 teaspoon of castor oil
- 1 teaspoon cod liver oil
- 125mg of broad spectrum antibiotics.

Normally a quarter (1/4) to 1litre of artificial colostrums is given per day for four days.

Students Assessment Exercise. SA.E.5.2

Why is artificial insemination not commonly used in Nigeria.

5.5 Conclusion

Adequate Feeding of small ruminants is necessary for improved productivity. The notion that ruminants can eat any thing and should therefore be allowed to scavenge results in poor performance and low economic returns.

Improper management of breeding flock results in high mortality rate of the young in particular and adults in general.

5.6 Summary

Feeding is one of the important factors in small ruminant production. the feeding of small ruminants varies with the age or physiological state of the animal.

The management of breeding flock is divided into three phases, depending on the different physiological state of he female. Young kids/lamb should be properly cared for in order to ensure their survival and optimum growth.

5.7 Tutor marked Assignment.

- Write a short note on the importance of colostrums to a newly born kid.
- List the constituents of artificial colostrums to a
- List the signs of heat in a goat.

5.8 References and Other Resources

Charray J. Humbert, J.M. Levif J. 1992 Manual of sheep Production in the Humid Tropics of Africa. Redwood Press Ltd. Melksham

Devendra, C. MCleroy, G.L. 1982 Goat and Sheep Production in the Tropics, Longman, London

King J.O.L. 1978. An Introduction to Animal Husbandry. Blackwell Scientific Pub. Britain

Answers to Students Assessment Exercise S.A.E. 5.1

Steaming has the following advantages

- Provides nourishment of the developing foetus
- Leads to better development of udder tissues.
- Ensures adequate milk production
- Prepares the dam for parturition.
- Ensures a strong kid/lamb at birth..

Answers to Students Assessment Exercise S.A.E. 5.2

Artificial insemination is not commonly practiced in Nigeria because of:

- Poor technical know-how
- Lack of enough proven banks.
- Inadequate semen bucks.
- Lack of chemicals for sperm storage.

Unit 6

RUMINANT HOUSING

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6.0 Introduction

This unit treats the issue of housing in sheep and goats. In the tropics indeed else where it is not common practice to house sheep/goats in special buildings as this is of little practical value to traditional rural rearers. Even in advanced countries it is within the past three decades that attempt to house sheep and goats permanently in environmentally controlled conditions is carried out to enable round-the-year production of lambs by the provision of artificial lighting pattern which enables ewe to produce up to two set of lambs per year. If sheep rearing is considered in relation to improved husbandry then the construction of a sheep house becomes essential.

6.1 Objectives

By the time you have studied this unit, you should be able to:

- Appreciate the need to provide housing for small ruminants.
- Construct a simple sheep/goat house using local materials at our disposal.
- Known the use of the various sections of a sheep/goat house.

6.1 Importance of sheep/goat house

Some of the importance of sheep/goat house are briefly discussed in the following sub-sections.

6.1.1 Protection from adverse weather condition

The major function of a sheep/goat house is to protect the animal from adverse climatic condition such as sunshine, rain, wind or cold. For the most part adult sheep/goat are equipped to withstand cold due to heat produce during the fermentation process but young lambs/kids have not yet develop this mechanism and should, therefore be protected sheep/goat do not like being drench by heavy rain, nor excessive such particularly when the sun is at its height. These can clearly be seen by the attempts the animals makes to seek shelter from excessive sun or rain.

6.1.2 Better Surveillance

When sheep/goats are kept together in a house, the owner can better observe them. He is therefore in a better position to notice sick animals and treat appropriately before the disease is spread.

6.1.3 Protection from Predators

By the provision of a house, sheep/goat are protected from predators such as dogs, snakes, thieves, accidents and other harmful vices.

6.1.4 Easy handling

Handling is easier, animals can be caught, and flock management is improved because it allows for certain management practices such as isolation of rams outside breeding season and weaning to be carried out. Other management practices such as identification docking and castration can be done easily.

6.1.5 Feeding of supplements is easier

This is so because animal of the same age or same physiological state such as yearlings, gestation, fattening weaning can be kept in the same group. This improves performance since each animal receives supplement meant to meet its particular production requirement.

Students Assessment Exercise 6.1.

List the importance of housing in sheep/goat production.

6.2 Construction Materials

There are several materials in the market available for the construction of a sheep/goat house. The major underlining factor is the resource (money) available to the farmer. The use of concrete, Galvanized iron and wire netting should not be regarded as the optimum. Sheep/goat house made of such materials do not necessarily produce the best animals. Good performance records have been obtained from sheep /goat housed in thatched roof supported with brush wood.

There is no universal solution. Natural materials easily available to the farmer which can be renewable at low cost seems better suited to our farmer.

It is not the materials used that determine whether a sheep/goat house is modern or traditional but the design, siting, care taken in its construction and above all, the way the house is maintained.

Local materials available include, palm, straw, mud, eathened floor banana leaves, bamboo, rope, planks etc.

6.3 Covered shelter with a yard

This appears the best kind of housing for our sheep/goats given the climatic condition, nature of sheep/goats and economic condition of most farmers.

While the covered house provide protection from adverse climatic conditions the yard provide space for exercise. Most times except in very wet conditions drinkers and feeding troughs can be left in the yard.

The sheep/goat house should not be sited in wet, water logged area. The house should be built on firm, even ground with a slight slope to allow rain water to run off.

Since sheep/goat houses are sources of unpleasant odours, noise and flies it should not be built in densely populated areas. As much as possible

especially in fairly large flocks it should be at the outskirts. With the shepherd's house following the sheep house on the same site.

The roof of the covered house should descend to a height of 1 -1.20m above the ground level to provide protection from wind. The ridge should then be at a height of 1-8.2m. This is sufficient to allow the shepherd access to the house.

If the post is made of brushwood, resistance varieties should be used so that they will not be easily damaged by insect or get rotted. Such wood should be treated with waste oil to prevent being attacked by insects and inserted into a concrete base which should protect them from soil moisture space requirement for various classes of sheep are:

Adult 0.20 - .040m²

Ewe with lamb 0.30 - .0.50m²

Young sheep 0.15 – 0.20m²

Ram 0.50 – 0.75m²

Space required for the yard should be calculated on the basis of 2 m- 3m² per head. The minimum height of yard should be 1m.

Note: The space required for animals in the covered house is given for tropical conditions where animals are not expected to stay in house for any appreciable length of time.

Several such yards can be located along side each other if there are several flocks that must be separated.

It is important to provide a gate with a width of about 2m to avoid jostling which occurs when sheep/goat leaves or enters the yard.

6.4 Lambing/kidding unit

This is an area used to isolate pregnant ewes/does a few days to and after lambing/kidding. This allows for close monitoring of the lambing/kidding unit for 3-4days. This is to enable a close observation of both the dam and the lamb/kid and to ensure that the lamb/kid has obtained colostrums from the dam.

When constructing the lambing/kidding unit the number of sheep/goats in the flock should be taken into consideration, the method of breeding and body size of the breed.

Feeding rack and water trough should be available. Unlimited supply of feed and water of the dam in the lambing/kidding unit is important where this is not available, the dam should not be taken there.

A high level of hygienic should be maintained in the lambing/kidding unit. Bedding used should be renewed after each lambing/kidding and burnt particularly of the floor is rammed earth.

6.5 Sheep/goat handling unit.

An essential requirement for all sheep and goat farm is an efficient handling unit, including a race, dipping tank and footbath. This should be designed in such a way as to allow all operations to be done quickly. With the minimum number of helpers and an absence of stress and strain on both men and animal.

Procedures carried out in the handling unit are : dipping, spraying, care of the feet, closing and inoculation and dragging.

All handling systems comprise the following features.

- A gathering pen-large enough to take all the sheep to be dealt with at one time.
- A forcing pen – This acts as a funnel to the race i.e. the narrow passage which sheep are forced into a single file with gates to enable sheep to be sorted out into separate pens.
- A dipping bath with draining pen
- A footbath
- Handling or treatment pens.
- Holding or drafting pens into which sheep pass after treatment and sorting.
- Handling unit should be sited centrally to grazing areas, free draining, shaded and convenient for access and loading. All construction must be free of sharp edges. Working area should be rooted to assist in the operations that must be carried out under all conditions.

Fig. Shows a small sheep handling unit.

Student Assessment Exercise 6.2

List the important features of a typical sheep/goat handling unit.

6.6 Conclusion

This unit has highlighted the need for adequate housing for sheep and goats low income farmers can take advantage of the local construction materials

available in their environment as this will save cost and when properly managed improve the performance of their flock.

6.7 Summary

The provision of adequate housing is necessary in sheep and goat production if improved productivity is to be achieved. Different construction materials are available. The resources available to the farmer and his environment determines what he uses. In the tropics a covered house with a yard is considered sufficient.

6.7 Tutor marked Assignment

- What is the use of a lambing/kidding unit in a sheep and goat house.
- List the factors to be considered when constructing a sheep/goat house.

6.9 References and Other Resources

Charray J. Humbert, J.M. Levif J. 1992 Manual of sheep Production in the Humid Tropics of Africa. Redwood Press Ltd. Melksham

Devendra, C. MCleroy, G.L. 1982 Goat and Sheep Production in the Tropics, Longman, London

King J.O.L. 1978. An Introduction to Animal Husbandry. Blackwell Scientific Pub. Britain

Answers to Students Assessment Exercise S.A.E. 6.1

Importance of housing in sheep/goats.

- Protection from adverse weather conditions.
- Protection from predators.
- Easy handling
- Easy supervision
- Feeding of feed supplements becomes easy.

Answers to Students Assessment Exercise S.A.E. 6.2

Features of a sheep/goat handling unit

- A gathering pen
- A forcing pen
- Dipping bath
- Foot bath.

- Treatment pen
- Holding pen.

Unit 7

MEASURES FOR DISEASE PREVENTION ON A FARM

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7.0 Introduction

This unit will treat in general the signs exhibited by a healthy animal, signs of ill health or disease, and general measures of disease prevention in a farm. Because these measures are similar for most livestock. It will be treated in one unit.

Health is commonly defined as freedom from disease and disease can be defined as any disturbance of the normal body processes which affects an animal adversely such an upset can be caused by physical injuries, bacteria, viruses, parasites, fungi or poison, or by dietetic errors, metabolic disturbance or hereditary defects. Every effort must be made to support health and so avoid diseases.

7.1 Objectives.

By the time you have studied this unit you should be able to:

- Identify a healthy animals in the farm.
- Identify and describe a sick animal
- Take necessary measures that should help reduce disease outbreak/incidence on a farm.

7.1.1 Signs of good health

There are a number of clinical signs which an animal attendant can look for which can give an indication of the health status of his herd.

A healthy animal is one whose body process function properly so that it can live an active life, grow steadily, reproduce and attain the maximum level of production of which it is genetically capable.

7.1.2 Attention to surrounding

A healthy animal shows interest in its surroundings. It is always ready to take flight if worried by anything that happens.

7.1.3 Good appetites

Healthy animals have good appetites, both on a pasture where it actively looks for its food and in the house, where it quickly consumes the food given to it ruminants chew the end normally. A first sign of illness is refusal to eat.

7.1.4 Animal posture and appearance

A healthy animal carries its head high and is alert. Dejected appearance are indications that all is not well with an animal.

7.1.5 Absence of discharge

Healthy animals do not have any discharge. The eyes are dry and clear, no nasal discharges or inflamed (swollen) running eyes.

7.1.6 Maintenance of weight

Healthy adult animals should maintain their weight and young animals increase their body weight. Animals showing obvious loss of body weight are probably unwell.

7.1.7 Normal Breathing

Breathing should not be too rapid or erratic and it should be noiseless continuous or intermittent coughing shows that there is an irritation in the respiratory tract.

7.1.8 Normal faecal appearance

Faecal appearance indicates the state of the digestive tract. Constipation and diarrhea are signs of digestive disorders. The urine of a healthy animal is pale straw- coloured liquid with a distinct smell.

7.1.9 Fairly constant body temperature

The internal body temperatures of healthy animals remain fairly constant at levels which vary according to species that of sheep, goats and cows range between 38.5°C -39°C. Temperatures may however, be raised by exertion particularly in hot weather and by fear, but disease is the principal cause of a rise in temperature.

7.2 Signs of ill health

In contrast to the above mentioned signs of good health. Animals that is sick or incubating a disease show some general systemic or local signs that must be carefully observed.

7.2.1 Listlessness

Animal lags behind the flock and keeps away from the other animals moving little if at all, and with its head down.

7.2.2 Lack of appetite

Animal shows no interest in feed.

7.2.3 High temperature

Any temperature above 39.5°C should be considered an indicative of disease probably infectious disease.

7.2.4 Congestion of mucosa around the eyes

This congestion is often accompanied by weeping sometimes it appears pale or white in the case of anaemia it may be yellowish in colour.

7.2.5 Running nostrils

This usually occurs with discharge of a purulent blood stained liquid. Nasal discharges is often accompanied by coughing.

7.2.6 Diarrhoea

This can easily be detected because the animals hindquarters and tail are dirty with swollen left flank.

7.2.7 The animals left flank appears swollen rather than hollow

7.2.8 Appearance of feet, udder, testicles and sheath

Appearance of feet, udder, testicles and sheath may show abnormalities and sheath that are usually manifested as heat, redness and pain on palpation..

Students Assessment Exercise 7.1

List five signs you can notice to indicate ill-health in a herd./animal.

7.3 General measures of disease prevention

Methods of disease prevention will vary according to the particular causal agent and in some cases the species of animal, but there are some few measures which have general application.

7.3.1 Quarantine

All newly purchased animals should be isolated and kept separately under observation for a period of 10 days. During this period any sign of ill health should be noticed and treated appropriately before the animal is introduced to the herd. This is important because it prevents the introduction of disease from outside. While in isolation, the animal should be dewormed, dethiced and given a broad spectrum antibiotics.

7.3.2 Vaccination

Animals should be vaccinated against preventable diseases such as at the right time and age.

7.3.3 Avoid overcrowding

Animals should not be overcrowded in a pen or house. Overcrowding allows for easy spread of disease particularly contagious disease such as disease caused by parasites and fungi.

7.3.4 Separate sick from healthy animals

Once an animal shows any sign of ill health it should be separated from the healthy ones and treated in isolation. This is to prevent it spreading the disease to others. When the animal is considered fully recovered it should then be reintroduced.

Young animals should be housed separately, adult animals may have infection agents to which they have acquired resistance and do not therefore suffer from the disease, but young animals are susceptible and may catch and develop disease.

7.3.5 Toxic materials

This should be kept away from animal, certain chemical compounds and plants are poisonous and may cause disorder it infested such materials should not be allowed to contaminate their food or drinking water. Animals grazing on good pasture tend to avoid poisonous plants.

7.3.6 Avoid under nutrition

Under nutrition is a major disease – causing error in a farm particularly seen in animals entirely dependent on grazing bare pastures or those under confinement but not properly feed.

This apart from causing a disease problem of its own lowers the resistance of he animal to other diseases.

7.3.7 Regular Dipping/Spraying

Animals should be depped or sprayed regularly against external parasite. Such as ticks and flees. This should be done more often during the rainy season. External parasite causes irritation on the animal and some are agents of disease when external parasites are left unchecked, hey have the overall effect of decreasing productivity.

7.3.8 Regular deworming

Deworm animals with broad spectrum anthelmintic once a month during the rainy season and less frequently during the dry season.

Students Assessment Exercise 7.2

Why should you spray or dip animals.

7.4 Conclusion

In livestock production a lot depends on the knowledge and action of the husbandry man to take care of his animals and prevent or minimize disease incidence on his farm. His knowledge of measures of disease prevent and signs of ill health will go a long way in improving animal productivity on he farm.

7.5 Summary

In this unit you have studied the signs and appearance of a healthy animals, signs exhibited by a sick animals and measures that should be taken by a

good husbandry man in order to maintain, prevent and minimize outbreak in a farm.

7.6 Tutor marked Assignment.

-Write a short note on five measures of disease prevention on a farm..

7.7 *References and Other Resources*

Charray J. Humbert, J.M. Levif J. (1992) Manual of sheep Production in the Humid Tropics of Africa. Redwood Press Ltd. Melksham

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Answers to Students Assessment Exercise S.A.E. 7.1

Signs of ill health in a farm.

- Lack of appetite.
- Congestion of mucosa around the eyed
- Running nostrils
- Diarrhea
- Swollen left flank

Answers to Students Assessment Exercise S.A.E. 7.2

Animals should be dipped or sprayed to kill external parasites such as ticks and flees which may be on the animal. Because these parasites cause irritation on the animal, they also cause anaemia due to their sucking of blood from the host in addition some of hem are agent of other diseases.

Unit 8

DISEASES AND PARASITES OF SHEEP AND GOATS

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8.0 Introduction

In this unit, you will be studying about the diseases and parasites of sheep and goats. Since most of the diseases and parasites are common to both sheep and goats they will be treated together.

Wastage due to disease and parasites is a source of serious economic loss and one of the main constraints to the development of sheep and goats. The disease incidence also becomes greater where a low level of nutrition causes reduced resistance. Poor sanitation and hygiene also affects the health performance of small ruminants.

Under traditional village husbandry systems 25-50% of lambs/kids borne are lost. Among adult animals, annual mortality ranges from 14- 20%.

8.1 Objectives

By the time you have studied these units you should be able to:

- Broadly classify disease according to their mode of spread
- Know the major diseases and parasites affecting sheep and goats.
- Control the incidence of such diseases and parasites on the farm.

8.2 Classification of diseases in sheep and goats

Three categories of diseases affecting sheep and goats.

8.3 Infectious diseases

Infectious disease include pest du petits ruminants, (PPR) contagious caprine pleuro-pneumonia and haemorrhagic septicaemic.

8.4 Non-Infectious diseases

This refers to various metabolic disorders

8.5 Parasites

Parasites especially internal parasites such as helminthes, seriously affect sheep and goats.

8.6 Some common diseases and parasites in sheep and goats

8.6.1 Pest du petits ruminants (PPR)

PPR, pest of all small ruminants is a major disease affecting small ruminants throughout tropical Africa, goats suffer more from the disease than sheep. PPR is caused by a virus similar to the rinderpest virus sign.

Fever, followed by watery eyes, discharge from nostrils, necrotic lesion on the buccal mucosa and diarrhea.

Treatment

Systemic antibodies notably long-acting terramycin.

8.6.2 Enterohaemia

This is a serious disease of sheep and goats. It is caused by the absorption from the intestine of the toxin of a bacterium. This bacterium is normally found in harmless numbers in the intestine, but when there is digestive upset the organism multiplies rapidly and produces large amount of the toxin. The disease is associated with animals in good condition usually exposed to grazing of lush grass or green crops.

Signs

Abdominal pains and severe diarrhoea the animal appears dull and listless. Animal usually recover.

Prevention

Avoid sudden change in feed without adaptation period.

Control

A vaccine is available for the protection of susceptible animals.

8.6.3 External parasites infestations

Mange is common but does not cause major problem to the animal.

Flies and like are also commonly found on sheep and goats but do not ensure serious disorder unless their numbers become excessive prevention – vaccinate young animals and if possible entire flock annually with the tissue vaccine use to prevent rinderpest.

Anthrax

This is an acute septicemic cause by a highly resistant organism, *Bacillus anthracis* Animals are infected through the soil that has been contaminated by the carcass of infected animals. The bacteria survives in the soil in the form of spores which is injected by the animal.

Anthrax is usually fatal death occurs within 24 hours. Recovery is rare.

Diagnosis

In the dead animal the whole carcass and organs are blackish in colour. The spleen particularly has a characteristic blackish appearance and is swollen

when cut it realizes a thick blackish liquid. Anthrax can be transmitted to man so care should be taken during post mortem.

Control

The carcasses, including the skin, should be destroyed because they contain the bacteria it should be buried deep in quicklime or burnt.

Prevention

Vaccination of all animals preferably before the rainy season. The vaccine should be injected subcutaneously in the recommended dose. Ticks are common and more serious because in addition to irritation and anaemia that all external parasites cause, they can transmit a wide range of diseases for which the diagnosis is difficult and necessitates laboratory test.

Control

External parasites can be controlled by regular dipping or spraying with an acaricide

8.6.4 Foot-rot

This is a common and serious disease that affects the flock. Foot-rot is caused by the growth of organisms fungi of a particular species in the demarcations of the foot. Other organisms found in the environment add to the infection. The causative organisms thrive best under wet conditions. During the dry season it becomes dormant and uncommon.

Signs

The first sign is lameness on examination the "frog" and coronet are seen to be swollen and painful on palpation. There may be discharge between the hooves. If not treated the condition can deteriorate and the animal may die.

Prevention

Animals should be kept away from wet, muddy or marshy pastures. Housing quarters should be well drained.

Control

Foot-bath should be carried out with a solution – containing 55 copper sulphate and an antiseptic. The affected part should be cleaned and all necrosed parts removed.

Affected animal should be isolated for a few days in a dry place.

Students Assessment Exercise S.A.E. 8.1

Why is the incidence of ticks considered more serious than mange or flies.

8.6.5 Mastitic

Mastitis is the infection of one or both udders by micro-organisms that are usually found in the environment. Mastitis does not usually threaten the dam's life, but the affected udder is often lost after recovery, so that the ewes productive capacity is impaired.

Signs

The affected udder is red and painful. The milk obtained from it is turned into a serious liquid, which may be purulent or blood-stained. Lamb-kids stops sucking from affected udder and an abscess may form with a mixture of milk, pits and blood oozing from it.

Prevention

Sheep and goat house should be kept clean and sharp objects that can cause injury to the udder should be removed.

Control

An antibiotic based preparation should be infused into the treatment after the udder has been emptied. Systemic antibiotics should be used.

8.6.6 Parasite gastro-enteritis.

This is caused by a massive infestation of the abomasums and intestine with small parasitic worms. Kids are particularly susceptible while adults are resistant.

Progressive loss of condition, which may proceed to a state of emaciation. Appetite usually remains goods until a late stage.

Prevention

Avoid restricted grazing since it leads to a build up of infective larvae. Majority of larvae die within 6 weeks of emerging from the eggs so resting pastures for the length of time will so resting pasture for this length of time will ensures a reduction of the larval concentration.

Control

Regular use of anthelmintics.

Students Assessment Exercise 8.2

Why is mastitis regarded as a serious disease on a farm.

8.7 Conclusion

You have studied the various diseases that can affect sheep and goats on the farm. The signs of such diseases, their preventive measures and mode of control. You will agree with me that a lot depends on the action of the keeper/rearer to prevent/reduce disease incidence in his herd.

8.8 Summary

This unit has treated some of the common diseases found in our environment. Their signs, preventive measures and control are outlined. It is no means exhaustive for further details the reader is referred to Hall (1985) and Devendra and Mcleroy (1982)

8.9 Tutor marked Assignment

-Write a short note on entroxamic in sheep and goats.

Answers to Students Assessment Exercise S.A.E. 8.1

- The incidence of ticks are considered more serious than mange because like other external parasite ticks cause irritation and anaemia to their host , but in addition ticks serves as vectors to various other diseases which they can transmit to the host animals.

Answers to Students Assessment Exercise S.A.E. 8.2

Mastitis is considered a serious disease problem because even though it rarely cause he death of an animal, it could affect he reproductive capacity of dams causing losses to the farmer.

8.0 *References and Other Resources*

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Unit 9

IMPORTANCE AND CLASSIFICATION OF CATTLE

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9.0 Introduction

In this unit, we will be studying about cattle otherwise referred to as Large. Cattle are a major source of livelihood to the indigenous cattle owners of the tropics of Nigeria. Attempts to improve and increase the productivity of cattle is an important route to improving the standard of living and nutritional status of both the owner and the entire country. This is achieved through the supply of meat and milk. Draught power, Manure, Blood meal, social functions e.g. mobile banks, insurance against crop failures etc.

9.1 Objectives

By the end of this unit, you should be able to:

- Known the origin and history of domestication of cattle
- State the importance of cattle as it relates to the Nigerian economy and agriculture..
- Describe the criteria use for classifying cattle.

9.2 Origin and history of domestication

The family of animals that includes all types of domestic cattle are known as the Bovidae. There are two types of domestic cattle in the world.

Bos Taurus (humpless cattle)

Bos indicus (humped cattle)

Hamitic longhorn and shorthorn types of cattle are believed to be the ancestors of all the B. Taurus breeds. The origin of the humped cattle or Zebu is Western Asia.

Hamitic longhorn, short horn and Zebu-type cattle were all introduced into Africa by immigrants from Western Asia.

9.3 Importance of Cattle

9.3.1 Meat and milk supply

Cattle plays an important role in improving over 70% meat demands of Nigerians while its milk is the most accepted when compared to other ruminants.

9.3.2 Draught power

Cattle is a very important source of farm power in Nigeria and in different parts of the world at different times. This is accessible to peasant farmers who cannot afford mechanized farm power. It has greatly reduced dependence on mechanized farm power which is very costly. It has enhanced the volume of crop production in areas of use and reduced drudgery in farming operations.

9.3.3 Manure

Cattle dung maintain soil fertility, Farm yard manure which consist of cattle feecal materials could be used to fertilized the soil. Cattle dung is a rich source of N.P.K. and in mixed farms can reduce the cost of fertilizer.

9.3.4 Blood Meal, hooves and horns.

Hooves and horns of cattle are fibrous protein used in gum industries. Blood meal and bone meal are used in feeding farm animals.

9.3.5 Farm diversification

Cattle provide desirable farm diversification. The produce milk and meat, while by-product (residues) of the crops are fed to the animals. Keeping the farmer productive all year round.

9.3.6 Social Function.

Maintain and uplifts prestige base on the number of cattle. It represent the position of the owner and the family in the society. Cattle are seen as a measure of status of the owner in he society, as mobile banks by nomads, as insurance against crop failures by mixed farmers and as items of religious worship and marriages by various groups of traditionalists.

Student's Assessment Exercise S.A.E. 9.1

List the importance of cattle in Nigeria agriculture.

9.4 Classification of cattle

On the basis of utility, cattle are wither milk type (Dairy), beef type,. Draught type or multipurpose.

9.4.1 Dairy cattle

They are narrow in body conformation, with wide hindquarters. The udder or mammary glands are large and well developed, top line should be straight, wedge-shaped. Dairy cattle are generally more docile due to many generation of selection and handling. There are rarely any African breeds that are uniquely recognized for dairying.

9.4.2 **Beef cattle**

They are blocky, rapid growth rate, more aggressive than the dairy. The best known Africa beef cattle is the Boran found in East Africa.

An important feature of this is a low skeletal proportion relative to the muscle. This ensures a high killing out of percentage.

9.4.3 **Draught cattle**

Are of a hardy nature able to take a lot of stress during work. They are docile. They are found more in sedentary agrarian societies of Asia and Africa.

Most of the breeds in west Africa, East Africa and South East Asia are convertible into draught breeds. Such conversion may require the castration of young bulls to increase docility.

9.4.4 **Multi-purpose cattle**

In the less well-developed areas of the world, cattle has not been selected for a single purpose, the owners device roles for this animals as the need arises. Cattle could be dual purpose producing meat and milk, meat and power, or power and milk.

Student's Assessment Exercise S.A.E. 9.2

List the different classes of cattle.

9.5 **Conclusion**

Cattle (large ruminants) contribute greatly to the nations meat and milk supply. Basically the **Bos Taurus** (humpless cattle) are regarded as temperate breeds while the **Bos indicus** (humped cattle) are regarded as tropical breeds.

9.6 **Summary**

You have studied the origin of large ruminant and the important role they plan in Nigeria agriculture. The classification of these animals into different productive groups have also be treated..

9.7 **Tutor marked Assignment.**

-What are the characteristics of beef cattle?

-What do you understand by Draught power?

9.8 *References and Other Resources*

Payne, W.J.A. 1990. Introduction to Animal Husbandary in the Tropics (4th ed) Longman, London.

Answers to Students Assessment Exercise S.A.E. 9.1

Cattle are important as sources of the following:

Meat and milk

Manure

Draught power

Incoe

Blood meal, hooves and horns

Social functions.

Answers to Students Assessment Exercise S.A.E. 9.2

The different classes of cattle are:

- Dairy cattle
- Beef cattle
- Draught
- Multi-purpose cattle.

Unit 10

CATTLE BREEDS

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10.0 Introduction

This unit will consider the breeds of cattle with particular reference to the tropical Nigerian breeds. Breeds of cattle differ from region and from one ecological zone to another, acclimatized to the specific zones or regions. A breed is defined as a group of animals having a common origin and possessing certain members of the same species. These characteristics are uniform by transmitted from generation and important to know.

It is therefore, necessary and important to know the various breeds either they are for dairy or beef to plan for their various management practices to improve production.

10.1 Objectives

By the time you have studied this unit you should be able to:

- Describe the Nigerian indigenous breeds of cattle in terms of origin and habitat, physical characteristics and utility.
- Identify a few dairy and beef breeds found in other parts of the world.

10.2 Nigerian Breeds of cattle.

The Nigerian breeds of cattle fall into several categories which are discussed in the following sub-units.

10.2.1 N'dama

It spread to most part of W/Africa from the Fouta Djallou highland of Guinea. It has acclimatized to conditions of the rain forest up to the southern limit of the north Zebu breeds.

It is a small, limbless, well-built animal with a straight top line and short, fine limb. The coat colour is usually yellow, fawn or light red. The udder of he female is very small and set high between the legs.

They are poor milkers (450kg maximum), sometimes used for draught purposes, essentially beef animals, tolerant to trypanosomiasis but breaks down under stress. Has meat of good quality. Matured live weight are 230-420kg.

10.2.2 Kuri

It is restricted to Lake Chad area and part of Borno state. Kuri cattle live on the island and the shores around the Lake Chad.

It is a tall animal with enormous circular or bulbous horns very thick at the base and humpless. The large horns are hollow and light are thought by some to help the cattle when swimming from one island to another in Lake Chad.

The Kuri is a meat and milk animal with average lactation yield of 600 – 700kg and a live weight of up to 650kg. It is a poor draught animal. They are white, light grey, sometimes with dark spots on the flanks.

Student's Assessment Exercise S.A.E. 10.1

What do you understand by a breed.

10.2.3 White Fulani (Bunaji)

It is an indigenous breed found in Northern Nigeria and accounts for about half the cattle population of Nigeria.

It has the ability to thrive under a variety of conditions. It is fairly large, height about 130cm, bull weigh about 50kg, cows 325kg. The hump is large and well-developed, navel flab is small and horns are of medium length and lyre shaped. The typical colour is white.

The white Fulani is a triple-purpose, with milk production of 2300kg per lactation. Crosses of white Fulani and Holstein increases milk production at NAPRI-Shika, Zaria. Age at first calving is 42-45 months but in Fulani herds it can be as high as 5 years. They provide much of the beef consumed through out Nigeria.

10.2.4 Sokoto Gudali

This breed is found predominantly in the former Sokoto province (Sokoto State). It is also called Bokologi.

This is a medium sized, short horned breed. The develop, hump, and navel fold are pronounced. The usual coat colour is gravisish, white or creamy. The hair is short and the skin is thick and pigmented. The ear are pendulous.

Sokoto candali are useful milkers. Their milk yield at Shika (NAPRI) are higher than for white Fulani. Has a calving interval of 360-450 days. It is also a useful beef animal. The matured live weight ranges from 300 -550kg.

10.2.5 Muturu

This is a West African dwarf short horn. It is found in the coastal area of West Africa. The breed is resistant to trypanosomiasis. The muturu is a humpless cattle usually having a dam brown or black coat colour. The body is compact and at maturity the bull can weigh up to 300kg. It is a very hardy breed and in most local community, it acts as a scavenger.

Other cattle breeds found in Nigeria include Keteku, Adamawa Gudali, Red Fulani (Rahaji)

10.2.6 Specialized cattle breeds.

In the developed countries of the world cattle breeds have been selected and improved upon for specific purposes of milk and meat production (dairy and beef). Examines of some specialized breeds are:

10.2.7 Beef Cattle Breeds

There are categories of cattle breed for beef and their origins are outside the shores of Nigeria as indicated in the following discussion.

10.2.7.1 Hereford

This breed is native to England, coat colour is very distinctive ranging from light to dark red, the colour of the face is white.

10.2.7.2 Brahman

This is an American Zebu mostly white in colour.

10.2.7.3 Aberden Angus

The breed is native to Scotland. Coat colour is black. The breed is polled. They matured at an early age and yield good quality carcass.

10.2.8 Dairy cattle breeds.

There are five common dairy breeds.

10.2.8.1 Hoiston-Frisian

Originated from Holland. Coat colour is mostly white or black. This is largely dairy breeds cow weight 567kg ewe 816kg bulls.

10.2.8.2 Jersey

Originate from the of Island of Jersey in Britain coat colour is light brown to black, black muzzle with a white ring encircling. Jersey is smallest of European breeds of cattle.

10.2.8.3 Guernsey

Originated from channel Island. Colour is light brown to red with white markings on the face, legs, switch and flank.

10.2.8.4 Ayrshire

Red with white markings or white with red marking. Colour is variegated.

10.2.8.5 Brown Swiss

Originate from Switzerland. Colour is light to almost black.

Student's Assessment Exercise S.A.E 10.2

Name two (2) beef and diary breeds each

10.3 Conclusion

There are some many breeds of cattle all over the world. The ones studied under this unit are just a few.

10.4 Summary

Breeds of cattle found in Nigeria have not been improved upon to identify their specific purpose. Elsewhere, cattle are specialized either for milk or meat. Some are however multi-purpose.

10.5. Tutor marked Assignment.

- Describe the white Fulani breed of cattle in Nigeria

10.6 References and Other Resources

Payne, W.J.A. 1990. Introduction to Animal Husbandary in the Tropics (4th ed) Longman, London.

Answers to Students Assessment Exercise S.A.E 10.1

A breed is a group of animals having a common origin and possessing certain well-fixed and distinctive characteristics common to other members of the same species.

Answers to Students Assessment Exercise S.A.E 10.2

Diary cattle breeds
Jersey, Guernsing
Beef cattle breeds
Aberden Angus
Hereford

Unit 11

MANAGEMENT OF DIARY COWS

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11.7	Drying the Cow
11.8	Conclusion
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11.10	Tutor marked Assignment
11.11	References and other resources.

11.0 Introduction

This unit will be treating the management of diary cattle. Diary cattle need to be properly feed and cared for if optimum production of milk is to be achieved: Optimum feeding of diary animals should be taken seriously as it affects their growth and resistance to disease.

11.1 Objectives

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

- care for a calve from birth to weaning
- feeding a lactating dairy cow adequately
- carry out all the management practices necessary for a safe parturition.

11.2 Management from Birth to Weaning

This period is most critical period for the survival of the calf. This is because at the first stage in life (1st – 6 weeks) the calf is susceptible to many diseases such as scours digestive disorders etc. If proper care is not taken this will result into a high mortality rate.

The calf should be separated from dam after the first 3-5 days. This period is necessary in order to allow the calf obtain colostrums from the dam. Calf should then be fed either concentrate or replace starter diet. Good quality legume hay should be provided at this time along side concentrate. The amount of growers concentrate to be fed depends on:

- size of the heifer
- amount of forage eaten by the heifer
- quality of the concentrate
- quality for the forage

Salt lick and plenty of water should be provided. Heifers are normally grouped together up to about 1 year. After this period bull heifers should be separated from female heifers to prevent premature mating. Heifers will show signs of heat at 12-15 months of age.

11.3 Signs of Heat

This is the period when the female is ready to accept the male.

- standing still to be mounted
- restlessness
- swollen vulva
- secretion of mucus
- swelling of the vulva
- frequent undnation
- monitoring of other animals
- snipping the urine of other animals

Heat period is better observed between 6pm to 6am. The female can be served by a male or through artificial insemination (AI). The pregnancy period is 9 months. At the end of which the calf is born.

Management practices such as flushing and steaming up should be carried out. The advantages of such practices have already been outlined in your notes on breeding management of small ruminants.

11.4 Care of Parturition

About 2 weeks to the end of parturition, the pregnant female is taken to a clean, disease free, well bedded, comfortable easily observed calving pen. The animal should be left in the calving pen without disturbance. The normal labour period of a cow is 2 hours. If labour is prolong thereafter and the calf is not yet born, the attention of a veterinarian should be sought.

11.5 Signs of Parturition

- Restlessness
- The vulva relaxes and swells up
- Enlargement of the udder
- Mucus discharge from the vulva
- sinking of the planks
- Seek isolation from the flock herd

Heifers normally have a longer parturition period than cows. The placenta should be expelled within 24 hours. The cow should not be allowed to eat the placenta as they do not digest it. This results in stomach upset.

Student's Assessment Exercise S.A.E 11.1

What are the signs of Parturition

11.6 Post-Partum Breeding

The first heat after parturition is observed 35-45 days after calving. This could extend to 50-75 days in matured animals in the tropics. This period is longer because of underfeeding or delayed involution of the reproductive tract.

Feeding is very important during this period as it affect the quantity of milk produced. Usually animals are fed concentrate rations according to their level of milk production. Animals are also grazed on good quality pasture.

Animals are not to be bred at the first post partum estrus. The second post partum occurs 90 days after calving at this time the animal is ready for re-breeding. Animals with problems during parturition should however be left until the third heat period.

11.7 Drying the Cow

This refers to the period that the animal is no longer producing milk. Drying period is necessary because

- It gives the animal sufficient rest before the next lactation
- Allow for repair and regeneration of secretory cells of the udder
- Improve milk production during the next lactation

The drying period last for 45-60 days. Animals should be fed with good quality concentrate and forage. When the animal is dried the treat must be

disinfected. The animal must also be given anti-biotics especially against mastitis. Both internal and external parasites should be controlled and vaccinations carried out against preventable diseases.

Student's Assessment Exercise S.A.E 10.2

Why should a cow be allowed a dry period

11.8 Conclusion

The proper management of diary animal is essential in order to obtain high level of production. Diary cows react immediately to poor nutrition by a sudden drop in milk production. Good level of sanitation should be maintained to avoid infection as milk is a good medium for the growth of micro-organisms.

11.9 Summary

You have studied the management of diary cows from parturition to the next gestation period. The attention that should be given at the various phases have been emphasized.

11.10 Tutor marked Assignment.

What do you understand by dry period. What is the importance of this to the cow and owner.

Why is adequate feeding of diary cows important.

11.11 References and Other Resources

Payne, W.J.A. 1990. Introduction to Animal Husbandary in the Tropics (4th ed) Longman, London.

Unit 12

MILKING PROCESS

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12.0 Introduction

In the previous unit you have studied the management of a dairy cow. This unit will treat the milking process in a dairy farm. The milking process is very important because bad milking methods leads to injury to the udder, reduces milk yield and may lead to disease such as mastitis. Milk is an important nutrient for humans. Milk contains proteins, calcium, potassium, phosphorus, vitamin A, riboflavin and thiamine.

12.1 Objectives

At the end for the unit, you should be able to

- manage a milking cow
- successfully hand milk a cow
- know the different milking methods available
- identify animals with bag traits in a milking herd and cull them.

12.2 Management of Milking Cows

Dairy cows are creatures of habit. They respond well to routine procedures. Milking is usually carried out twice a day – early morning and late afternoons 5.30am and 3.30pm. More than twice a day milking can be done. This has been shown to increase milk production but the labour involved is high.

Between the two milking periods animals are either grazed, or fed concentrate in pens or both. In the tropics, it is advisable to graze animals in the mornings and evenings because of high ambient temperatures during the day. Grazing should not be done too early in the morning, however, to prevent bloat which is caused by cattle consuming much grasses or grasses covered with dew in the early mornings.

Concentrate feeding of dairy cow is done in relation to its milk production.

12.3 Milking Systems

There are two milking methods.

12.3.1 Hand Milking

This is the method in use by our traditional herdsmen. Hand milking is laborious, time consuming, inefficient, leads to injury to maker, high incidence of milk contamination which may be by the cow or herdsmen or by dust, dirt and insects. It is however cheap. Hand milking is also practiced with certain breeds of cattle e.g. Sahiwal which has a large teat that cannot enter the milking cup.

12.3.2 Machine Milking

This method is more efficient since large numbers of cows can be milked within a short time. Machine milking usually takes a short time. The milk obtained from machine milking is clean and free of contaminants. It is however expensive to acquire the machines instead, operate and maintain them.

The operation and maintenance also needs expert.

Student's Assessment Exercise S.A.E 12.1

List the advantages and disadvantages of hand milking

12.4 Milking Procedure

The milking process normally occurs in a step by step orderly manner. The process is as follows:

- (a) Both the milker's hand and equipment should be cleaned and sanitized to prevent contamination by micro-organisms.
- (b) Udder and teat of cow should then be washed with warm water and a sanitizing solution and massaged. It is advisable to use individual napkins or disposable paper to clean the udder after washing. Washing of udder stimulates milk ejection and prevents contamination.
- (c) When hand milking is done it is rubbed with vaseline in order to soften the teat.
- (d) Whether by hand or machine milking the teat is pressed for a few seconds to check whether it is pure or not. If there appears to be any clots, pus or blood stain then the cow is having mastitis. The cow should therefore be milked last and the milk thrown away.
- (e) For uncontaminated milk the cow is then hand milked or the milking machine is attached gently to the teat and the animal is milked.
- (f) After milking the machine is removed gently from the teat as soon as milk flow stops and the machine is then detached.
- (g) The teat is then dipped in an antiseptic solution to prevent contamination.

12.5 Some Bad Traits in Milking Cows

Bad traits exhibited by cows during milking are numerous. However, some are highlighted in the following sections.

12.5.1 Kicking

Some cows can kick when being milked. This may occur as a result of the following.

- rough handling by the milker
- over milking
- injury

Such cows will no more remain quiet for milking and will also not let down their milk.

In order to prevent this cows should be

- Given concentrate during milking
- The calf should be allowed near the cow

12.5.2 Milk Leakage

Sometimes the Sphinter's muscles gets weak, the teat opening will therefore not close tightly enough. This lead to milk leakage. Such animals should be culled.

12.5.3 Hard Milking

Sometimes the teat could be too hard and milking becomes difficult particularly with hand milking – such cows should be sold.

12.6 Milk Production Pattern

Milk production of well fed and managed diary cows follows a definite pattern. There is first an increase which gets to a peak, it stabilizes at this point for a period of time then declines until the animal dries up as shown in fig below.

For improperly fed or managed animals the milk production does not follow any particular pattern.

Average of the peak period of lactation is about 30 days in the tropical animal. This is because of poor feeding and watering, high temp, pest and disease attack.

12.7 FAT-Corrected Milk Yield or 305 Days 4% FAT Milk Yield (FCM)

Lactation period varies from one animal to another. The composition of milk also varies. Milk contain the following.

	Water	Temperature	Tropical
Dry Matter	87.2	86.1	
Fat	12.8	13.91	
Solid-Not-Fat	3.4	5-6	
Protein	9.1	9.3	
Lactose	3.5	4.9	
Minerals	4.9	3.7	
	0.7	0.7	

The different breeds of dairy cows makes it necessary to standardize milk yield of different breeds of animals. This is done for the following reasons.

- To determine the milking ability of a cow
- To compare milking abilities of different cows
- Standardize the lactation period
- Compare the performance of difference of difference slaughters of a particular male.

The 305 day 4% fat milk yield (fat corrected yield) is the amount of milk containing 4% fat produced by the cow that is milked twice a day during a lactation period of 305 days. The formula is:

FCM = $0.4 - 15F$ where

Y = actual milk yield of the cow

F = amount of fat in milk

e.g a Bunaji cow produce 1600kg of milk containing 3-4% fat.

What is the FCM:

$$\frac{3.4}{100} \quad \times \quad \frac{1600}{1}$$

$$(0.4 \times 1600) + [15 \times \quad]$$

FCM =

Student's Assessment Exercise S.A.E 12.2

Give reasons for the Zig-Zag pattern of milk produce by some cows.

12.8 Conclusion

Milk is important food for humans particularly infants and invalid. It contains all the amino acids require for optimum growth and development. The process of obtaining the product from the cow is important and should be carried out under hygienic conditions.

12.9 Summary

Milking is an important activity in a dairy farm. Whether milking is done by hand or machine it is necessary that rules and procedures be followed.

12.10 Tutor marked Assignment

Advance possible reasons for kicking by a milking cow

- Why is it necessary to convert milk yield to fat-corrected yield.
- Give formula for FCM

12.11 References and Other Resources

Brumbly, P. and Gryseels, G. (1985). Stimulating milk production in milk deficit countries of Asia and Africa. In Smith, A. J. (ed). Milk production in developing countries, Centre Trop. Vet. Med. Univ. Edinburg, U.K.

Payne, W.J.A., 1990. An introduction to animal husbandry in the tropic (4th), Macmillian London

Answers to Students Assessment Exercise S.A.E 12.1

Advantages of Hand Milking

- Inexpensive
- Easy to practice
- The best method for certain breeds of cattle.

Disadvantages of Hand Milking

- Laborious
- Time Consuming
- May lead to injury of cow and milker
- Milk can be easily contaminated

Answers to Students Assessment Exercise S.A.E 12.2

Reasons for zig-zag pattern of milk produced

- Poor nutrition
- Inadequate water intake
- High temperature
- Pest and Diseases

Unit 13

MILK PROCESSING AND PRESERVATION

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13.0 Introduction

In the previous unit you have studied the management of the dairy cow. In this unit you will be studying about milk and its products.

The development of the dairy industry is mainly in the hands of the Fulani woman. Product development and marketing has been static because of their

limitation in western education. Transporting and Nomadic way of life has little or no government participation or control of the traditional dairy industry.

13.1 Objectives

By the time you have studied this unit you should be able to:

- a) Know the properties of milk
- b) Advance reasons why milk should be processed
- c) Be conversant with the different processing methods.

13.2 Definition of Milk

Milk is a fluid food produced in the mammary system of female animals following parturition. It is an emulsion of butter fat and water aqueous phase contains proteins, lactose, minerals and enzymes.

13.3 Properties of Milk

13.3.1 Taste and Odour

Milk has in it a slightly sweet taste and a milk aromatic flavour. The sweet taste comes from lactose while the flavour comes from the fat.

13.3.2 Colour

Normal milk has a yellowish white colour because of the presence of fat and small amounts of colouring matter. The breed of the animal and type of feed has an effect on the colour of the milk is deeper yellow in colour when animals are on pasture than when they are concentrate feed.

13.3.3 Specific Gravity

Milk is heavier than water because of the dissolved constituents. The specific gravity of milk is between 1.02 and 1.034.

13.3.4 Acid-Base State of Milk

Milk has a pH of 6.6 – 6.8 and is slightly acidic. The substances giving milk its apparent acidity are the phosphates, citrates, casein, albumin and dissolved carbon dioxide.

13.3.5 Freezing and Boiling Points of Milk

Milk freezes from about 31°F milk and whole milk have the same freezing point. The boiling point of milk is higher than that of 14°F.

13.3.6 Cream Rising

When whole milk stands for a while. The fat rises to the top because it is lighter than water. eventually forms a layer packed with fat globules called cream. When cream is agitated by churning, larger clump forms to yield butter.

13.3.7 Foaming

Milk foams on heating. This is due to air which becomes incorporated into the thin layers of milk formed by coagulating proteins.

13.4 Processing of Dairy Product

This is the application of some treatments to raw milk to make it safe for human consumption or to convert it to other desirable products such treatment could involve heating and cooling for separation of milk constituents or fermentation.

13.5 Reasons for Processing Milk

Raw milk goes sour when kept at ambient temperature over a period of time. Milk obtained from the udder of an animal contains different types of bacteria some of which could cause disease. So milk needs so much form of processing for various reasons.

(h) ***Safeguard Public Health***

This is achieved through either pasteurization or sterilization of milk and milk products. The process ensures the domination of disease causing pathogens.

(i) ***Reduction of Water Content of Milk***

This reduces the bulkiness of milk and cost of transportation. Milk contains about 87% water. Thus evaporated or condensed milk products are cheaper to transport.

Enhances shelf life and reduces storage space processed milk has longer without getting bad and then condensed the bulkiness reduced.

Production of other desirable products milk can be processed into other products such as cream, cheese, butter. To conform to industrial and health regulation.

13.6 Processing Methods

13.6.1 Pasteurization

This is a process by which milk or milk products are heated to a specific temperature and held there for a specific time to destroy all pathogenic bacteria. Are two types of pasteurization.

- holding vat or batch method
- high temperatures short time method.

In the holding vat method, milk is heated in the holder pasteurizer at temperature of 62°C for about 30 minutes. The pasteurized product is then cooled for packaging.

The short time method involves heating the product at a high temperature usually at 72°C for 15 seconds.

Pasteurization kills about 99.6% of all bacteria in milk.

Students Assessment Exercise 13.1

Name the different types of Pasteurization

13.6.2 Sterilized Milk

This is a product obtained from raw milk that is treated to high temperature 92.97°C for a period of between 16-30 minutes so that all micro-organisms are destroyed. The flavour of pasteurized milk is not very pleasant and such a high temperature heating may result in decrease in vitamin content.

13.6.3 Evaporated Milk

This is the product of evaporating water from whole milk at 70-73°C in a vacuum. About 50% of the water in original milk is boiled off. This process can be achieved in a home by slowly boiling milk in a pot. Commercially this product is filled into tins and sterilized under pressure.

The storage life of the product is unlimited normal temperature as long as the tin or container is not opened.

13.6.4 Other Process

A few other processes are used to make milk more acceptable and to improve it keeping quantity. Milk can be homogenized before heat treatment to reduce fat globule size so that will remain dispersed and will not form a cream layer.

Milk is sometimes frozen as a means of having a regular supply throughout the year. A rancid flavour often develops in a cow milk as the fat globules membrane is broken by freezing.

13.7 Milk Powders

Dried Milk Powders are very suitable products for the developing countries because, dried milk can be kept without

- (a) refrigeration
- (b) be transported easily
- (c) be mixed easily with other food stuffs
- (d) available all year round

Whereas milk, skim milk and butter milk can all be successfully dried. This involves pasteurization then condensation into one-third of its volume then dried by roller or spray drying.

13.8 Packaging and Distribution

Methods of packaging and distribution are tailored to the customers, requirements and income. In many cases milk is best left unpackaged from containers to provide the cheapest possible supply to low-income customers.

In most countries, there are some customers willing to pay for packaged milk. Despite the higher cost, the advantages of packaged milk to the customer are:

- (a) Convenience
- (b) Milk that has better keeping qualities
- (c) Milk is accurately measured and safe from adulteration

A variety of packaging methods are used include returnable glass bottles, plastic bottles, card-board cartons, plastic sachets and sealed cans.

Dried Milk Powders is a very suitable produced for the developing countries.

Students Assessment Exercise 13.2

What are the advantages of Milk Powders.

13.9 Conclusion

Milk processing is necessary in order to extend its shelf life of different methods of processing are available farmers should choose methods that can be easily adapted.

13.10 Summary

Milk is an important product which contain all the essential nutrients. The properties of milk in most cases determines is determined by its constituents. Processing of milk is necessary and the various processing methods have been highlighted.

13.11 Tutor Marked Assignment

- Define Milk
- List four reasons for milk processing
- List three methods of processing

13.12 References and Other Resources

Brumbly, P. and Gryseels, G. (1985). Stimulating milk production in milk deficit countries of Asia and Africa. In Smith, A. J. (ed). Milk production in developing countries, Centre Trop. Vet. Med. Univ. Edinburg, U.K.

Payne, W.J.A., 1990. An introduction to animal husbandry in the tropic (4th), Macmillian London

Answers to Student's Assessment Exercise – S.A.E. 13.1

Types of Pasteurization

- Holding or Batch Method
- High Temperature Short Time Method

Answers to Student's Assessment Exercise – S.A.E. 13.2

- Milk powder can be easily mixed with other food stuffs
- Milk is available all year round because of long shelf life
- Ease of Transportation

MANAGEMENT OF BEE CATTLE

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14.0	Introduction
14.0	Objectives
14.0	Range Bull Management
14.1	Cow-calf Programme
14.2	General Herd Management Practices
14.2.1	Removal of Bulls
14.2.2	Management of First Calf Heifers
14.2.3	Calf Management
14.3	Calf Weaning
14.4	Management of Dry Beef Cows
14.5	Conclusion
14.6	Summary
14.7	Tutor Marked Assignment
14.8	References and Other Resources

14.0 Introduction

The beef cattle is kept mainly for the production of meat, through some breeds can produce appreciable quantities of milk. Beef is one of the world's most desired food products and contribute immensely in terms of income to any nations. Economic impact of beef enterprises is further enhanced by income from subsidiary industries such as transportation, marketing, feeds, supplies, vaccines, antibiotics and financial agencies that survive because of the beef industry. The management of beef cattle include the cow-calf programme, breeding, herd management in summer and winter, stocker program, finishing program, the baby-beef program, fat-calf program, the pure-breed program, etc.

14.1 Objectives

This is to make the student understand

- (a) the beef cattle and its importance in the economy of any nation
- (b) the knowledge and management skills required for range bull; cow-calf program, breeding herd program, calf management, etc.

14.2 Range Bull Management

There are various ways of acquiring range bulls, each method fits a particular operation and has its advantages and bulls when they are 2 years of age and ready to turn out on pasture or range. Managing bulls prior to breeding season is very important and if properly conditioned should be capable of breeding 20-25 cows. At this time a reasonable high-energy ration must be given and then gradually 'let-down' and not just turn out to forage for themselves. The 'let-down' period consists of gradually decreasing the high-energy ration and substituting light feed. Exercise is vital and gradual elimination of the high energy ration will condition the bulls to perform much more efficiently during breeding season.

Young bulls less than 2 years should be used in only limited service unlike old bulls and should be supplemented with growing ration balanced for energy, protein, vitamins and minerals everyday. Two months prior to breeding season, given old bulls should be given increased supplemental feed so as to make them gain a healthier condition at 'turn out' time. Bulls not properly conditional prior to breeding season may be either too fat or too thin and may experience a lack of libido or lower fertility.

The length of the breeding season determines management. The shorter the season the greater the stress placed on the bull. At a ratio of 25 cows to 1 bull. A concentrated breeding season of 60 days allows only 2¹/₂ days per service while an extended season of 120 days allows practically 5 days for each service. The proportion of bulls to cows is dependent on:

- (i) the rougher the topography, the greater the number of bulls required.
- (ii) age of bulls
- (iii) feed conditions on range during breeding season i.e. lack of feed will force cows to spread out to seek feed thus bulls have to travel distances to check cows. Bulls properly conditioned prior to breeding season will insure a high conception rate.

14.3 Cow-Calf Program

A cow is pregnant for 280 – 285 days and if she is to calve every 365 days, she has only 80-85 days from time of calving until she must be pregnant. Experiments have shown that pregnant cows receiving moderate level of feed required assistance at birth than those receiving low level of feed, thus pregnant cows on low level of feed experienced less calving problems and low calf losses; but they are slow in returning to heat following calving.

Before calving time, a calving facility such as a pull stall and small pens for cows to ‘mother’ the calves after birth must be provided. Make identification bands available. Sort out heifers 120 days at least from cows for calving so as to provide them with proper levels of nutrition. Determine expected calving dates.

The nutrient requirements of a cow increase following calving and thus they should be separated from cows that have not calved, but this nutrient requirements have not been well established. The requirements vary according to cow size, milk production of cow and climate. It is thus difficult to say that a cow needs this quantity of nutrients after calving. Also the energy requirements for a cow suckling a calf are the most difficult to supply as energy required in large amounts and the amount of grass available varies from season and year to year. It is also difficult to measure the amount of energy a cow is getting from a pasture.

Students Assessment Exercise 14.1

Explain why the length of the breeding season determines the management of beef cattle.

14.2 General Herd Management Practices

14.4.1 Removal of Bulls

After breeding season the herd is gathered and the bulls are separated from the cows; younger bulls also separated from older bulls and placed in a separate. Thin bulls with supplemental feeds, together with good forage, salt and other minerals. Periodically spray or treat bulls to control flies and parasites.

14.4.2 Management of First-Calf Heifer

Give special treatment to heifers calving for the first time, at second calving, they should be grazed or fed separately from older cows because they are less aggressive and can be pushed away and cannot get their share of pelleted protein supplement, for example. The heifers are getting a new feet cannot eat as fast as older cows, provide heifers with some of the best grazing land.

3.2.3 Calf Management

- (a) Castration when calves are 4-10 weeks. At the same time the calves can be branded and vaccinated. There are several methods of castration – one that allows for complete drainage; or with the use of dastrator etc.
- (c) Branding and identification either by tattooing numbers on calves ears shortly after birth and/or apply numbered metal or tag (plastic ear-tages)
- (d) Vaccination for prevention of blackleg and malignant edema etc
- (e) Detouring which helps the appearance of the animals and prevents injury to other animals especially in feed lots.
- (f) Parasite control: Separate cows from calves and spray calves first with a lighter concentration of the chemical.
- (g) Orphan calves or calves from multiple births should be ‘grafted’ on a cow that has lost her calf or raised by artificial methods.

Some cows may give enough milk to feed twins. They must allowed to take colostrums since antibodies transmitted by it help calves to survive due to the passive immunity which protects them from infectious. Colostrum is a rich source of vitamins and minerals.

Calves can be reared with cold milk provided in containers with nipples. They are also fed fortified grain mixture and can be expected to consume 1b of dry feed per head at 3 weeks. Dry feed consumption increase sas calves get older. Most commercial milk replaces and starter feeds can provide adequate nutrition if used as directed.

14.5 **Calf Weaning**

Weaning represents both a nutritional and psychological change in the life of a young animal after 7-8 months of life in constant association with its mother for protection and food. The time to wean depends on the season type of management. Weaning calve is influenced by the time of the year and whether they are to be kept as stockers or sent directly to the feedlot.

Weaning by separating the calves from the cows at a considerable distance so that the calves are out of sight/or hearing of prolonged bawling of cows. The calves should be encouraged to eat as fast as possible.

During the first few days they should be confined to small areas to cut down on walking and weight loss. They should be divided into groups according to

size and sex and be protected from harm of weather conditions and predators. Provide clean water always and palatable feed – corn or sorghum silage with a protein supplement, a high quality grass-legume hay plus a concentrate supplement or a combination of these feeds.

Before weaning calves feeds are placed in creeps where only they have access to calves should not be disturbed during first few days after weaning.

Students Assessment Exercise 14.2

List the main operations to be carried out in calf management.

14.6 Management of Dry Beef Cows

First feed the animal accordingly. There is a considerable variation in the amount and quality of feed needed by individual cows. Age, maturity weight and condition of the cow are major factors which determine her feed requirements. Management of dry herd demands that the cows and heifers be divided into groups according to their feed needs.

The nutrient requirements of dry, pregnant, mature cows as regards energy, protein, minerals and vitamins are all essential and needed in varying amounts by pregnant cows.

14.7 Conclusion

The obvious goal of beef cattle production is to obtain maximum benefit over an extended period of time. The management of beef cattle involves a very careful feeding and supervision of range bulls, cows and calves, weaning of calves etc. to meet the desired costs in management include feed, labour, investment in land, cattle and equipment. Management does not relate only to minimum costs but also timely marketing of calves, cull cows and bulls and to persistent in the production of breeding herd.

14.8 Summary

The management of beef cattle at various stages of growth is determined by their nutritional and psychological needs as well as managerial skills of the herdsman. This explains why the skills involved in the management of calf, calf weaning, first-calf heifer, etc. are slightly different.

14.9 Tutor Marked Assignment

Briefly explain how calves are weaned

14.10 References and Other Resources

- J.K. Loosil, V.A. Oyenuga and C.M. Babtunde 1999. Animal Production in the Tropic Proceedings of the International Symposium on Animal production in the tropics.
- C.C.O. Mary and Irwin A. Dyer, 1974. Commercial Beef Cattle Production., Lea and Feliger, Philadelphia
- M.McG, Cooper and M. B. Wills 1989. Profitable Beef Production, Farming. Press
- David Allen and Brian Kikenning 1980. Planned Beef Production. Granada, London Toronto Sydney New York, Granda Publishing.

Question 1 - S.A.E. 14:1

This is because in the shorter season a lot of stress is placed on the bull. If the breeding season is only 60 days and a bull is expected to service 25 cows only 2¹/₂ days per service is expected of the bull if the breeding season is 120 days and bull/cow ratio is 1 to 25, practically 5 days for each service is allowed and this lessens the stress.

Question 2 - S.A.E. 14:2

Calf management involves:

- (a) Castration when 4-10 weeks old
- (b) Branding and identification – could be within 4-10 weeks old
- (c) Vaccination
- (d) Dehorning
- (e) Control of pest and diseases
- (f) Calves that are orphaned can be ‘grafted’ on a cow that has lost her calf. Some can be raised artificially by providing such extra milk to them. But calves must be allowed access to colostrums which contains antibodies and protects them from infectious.

Orphaned calves can be reared with milk provided in containers with nipples. They are also feed fortified grain mixture and at 3 weeks can start on dry feed. Commercial milk replacers and starters can provided adequate nutrition to orphaned calves if used as directed.

DISEASE AND PARASITES OF CATTLE

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15.3.2.2	Bacteria, viruses and protozoas
15.3.2.3	Viral Diseases
15.3.3	Protozoan Disease
15.3.4	External Parasites
15.4.0	Conclusion
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15.7.0	References and other Resources

15.1.0 Introduction

Disease may be defined as any abnormal structure or functional change in the tissues of animal. The direct or indirect causes of disease are numerous and in cattle we condense them into traumatation, chemical causes, faulty nutrition, poisons of various kinds, internal and external parasites, bacteria, viruses and congenital conditions. Note than parasite is a plant or animal that lives upon or within another living organism at whose expense it obtains some advantage.

15.2.0 Objectives

This write up is aimed at educating the students to:

- (i) Know the meaning of disease and parasites
- (ii) Acquaint themselves on the causes of diseases
- (iii) Know the common diseases and parasites of cattle, and
- (iv) Symptoms of some diseases and their control or preventive measures.

15.3.0 Causes of Disease

15.3.1 Mechanical Causes

This are involved not only in external injuries but also in such conditions as stomatitis due to arms (a long sharp slime on a seed), mechanical premonia, traumatic gastritis (inflammation of things of the stomach), and injuries due to interference during giving birth (Parturition) by laymen.

15.3.2 Chemicals

This may produce injury by caustic action but the main abnormal conditions are due to absorption of chemical poisons following accidental access, or of toxic drugs following their faculty administration. Examples are sodium nitrate, arsenic and many other poisonings due to chemicals. Plant poisoning is also an example.

15.3.1 Faulty Nutrition

This is also in valued in the etiology of many diseases of animals and the cattle husbander should posses the latest knowledge on nutrition and nutritional deficiencies.

15.3.2 Bacteria, Viruses and Protozoans

These invade the body in various ways, mainly through the digestive, respiratory, and genitor-urinary tracts and the skin. The ability of the infective agent to cause disease depends upon the virulence of the organisms, degree of exposure (number of organisms) and the resistance of the host. Infective agents are transmitted from animal to animal by biting insects, by direct contact between susceptible animals and sick or carrier animals or indirectly from surroundings contaminated by blood, sections and executions of diseased animals.

Diseases caused by bacteria anthrax which is transmitted through water and food contaminated with blood and excretions or by wound infections. It has an incubation period of a few hours to 1-2 weeks and causes sudden death in cattle. It may be prevented through vaccination. Another example of cattle bacterial disease is contagious borrne pleuropuemonial (CBPP) which transmitted through close contact with infected animals and inhalation of disease organisms. Its incubation period is 14 days to several months and symptoms are frequent painful cough, often gasping and thick mucus discharge from month and nose, the animal dies within 1-3 days. Through animals vaccination or slaughter and discard those with acute cases.

15.3.3 **Viral Diseases** of cattle include foot and mouth (FMD) disease transmitted through direct contact or contact with material contaminated with discharge from lesions, or wind-borne. Symptoms are salivation, blisters on tongue and feet, high fever, lameness. Prevention is by segregation, isolation premises, strict sanitation, vaccination of valuable stock. Another cattle viral disease is rinderpest or cattle rinderpest transmitted through direct contact, or contact with material contaminated with discharge from lesion. There is high fever, blood stained diarrhea, severe erosive mouth lesions, acute outbreak affecting many animals prevention by vaccination of the calves and 12 months later.

15.3.4 **Protozoan Diseases** caused by protozoans include trypanosomiasis (Magana) which is transmitted by tse-tse flies causing intermittent fever, restlessness, progressive emaciation, lowered productivity and death. Prevented by fly eradication, use of trypanosomiasis tolerant breeds or use of chemoprophylaxis. Another example of cattle protozoan disease is piroplasmiasis (babesiosis or red water) which is transmitted by infective ticks causing fever, reddish urine and progressive weakness.

Prevention by controlling or elimination of ticks and immunization. Note that internal parasites of cattle include protozoa, helminths, or worms. Other protozoan diseases include anaplasmosis and coccidiosis.

Students Assessment Exercise 15.1

Question 1:

How is anthrax contracted by cattle?

List the symptoms and preventive measures.

15.3.5 **External Parasites** cause disease in cattle and they are mainly ticks and biting flies. In short, they cause what is called rickettsial diseases which include heart water which is symptomized by high fever, hemorrhagic signs, combustion or may be sudden death. Another external parasitic disease of cattle is anaplasmosis which is caused by infective ticks biting flies, contaminated blood on knives, etc. The signs of the disease include high fever, jaundice, distressed breathing, unsteady gait varying from acute to mild and chronic. The disease affects cattle, especially newly imported susceptible stock; most severe in older animals. Prevention is by chemotherapy in early stages; vaccine for control. **Students Assessment Exercise 15.2**

Question 2:

The ability of any infective agent to cause disease depends on what factors?

15.4 Conclusion

Disease may be defined as any abnormal structure or fractional change in the tissues of the body. The direct or indirect causes of disease are many and in cattle we condense them into trauma, chemical causes, faulty nutrition, poisons of various kinds, internal and external parasites, bacteria, viruses, protozoans and congenital conditions.

15.5 Summary

This unit is to enable the student to understand the common diseases and parasites of cattle, their effects on cattle production and the best possible ways of identifying, controlling or treating them.

15.6 Tutor Marked Assignment

What causes trypanosomiasis in cattle?
List the symptoms of the disease and the preventive measures to be taken.

15.7 References and Other Resources

Fincher, M.G. et al Diseases of Cattle. American Veterinary Publications, Inc.

Hill, D.H. 1988. Cattle and Lauffals heat production in the tropics, intermediate Tropical Agriculture series. Longman Scientific and Technical pp.153-177

Rause, John, E. 1973. World Cattle III. Cattle of North America.

Rue Jensen and Donald R. Mackey 1979. Diseases of Feed lot Condition
Lea and Febiger, 1979 Philadelphia

Students Assessment Exercise 15.1

Answers to Students Assessment Exercise S.A.E. 15:1

Q.1 - Anthrax is bacterial disease in cattle which is transmitted through water and food contaminated with blood and excretions or by wound infections.

The symptoms are - high temperature, swellings, abortion, and diarrhea.
Prevent through vaccinations, sanitation.

Answers to Students Assessment Exercise S.A.E. 15:2

Q.2 - The factors are (1) the virulence of the organisms (2) degree of exposure and (3) the resistance of the host.

caused by protozoans
transmitted by tse-tse flies symptoms are:

- intermitted fever
- listlessness
- progressive emaciation
- lowered productivity
- death

Prevent, control or eliminated by

- introducing trypanotolerant breeds
- fly eradication
- use of chemoprophylaxis

Each one of them carries / mark x 10

Unit 16

FEED AND MATERIALS OF RUMINANTS

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16.0 Introduction

In this Unit you will be studying about the various types of feed materials that are available in your environment for the feeding of our ruminant animals as mentioned in our discussion in an earlier unit on the digestive ability of ruminants.

Adequate nutrition is important for optimum growth and development of our animals. Even though ruminants can survive on forage. It does not contain enough nutrients to meet the animal need for growth and production. Their feed should therefore be supplemented.

16.1 Objectives

By the end of this Unit you should be able to

- (i) Define certain terms used in feeds and feeding of ruminants
- (ii) Know the different categories of feed materials
- (iii) Identify seed material common to your locality that can be used in ruminant feeding

16.2 Definition of Certain Terms

Certain Terms are commonly used when discussing feeds and feeding materials.

16.2.1 Feed

A feed is mixture of feedstuffs blended or processed in a form which is acceptable to livestock. It can also be expressed as that material which after being ingested by an animal is capable of being digested, absorbed and utilize by the body either for maintenance, growth or production.

16.2.2 Nutrient

This is any food constituent or group of constituents of the same general chemical composition that aids in the preservation of same examples of nutrients are proteins, carbohydrates, water, fats/oils, minerals and vitamins.

16.2.3 Ration

This refers to a fixed amount of feed that is given or allocated to an animal on a 24 hour basis or total feed given to an animal during a 24 hour period.

16.2.4 Diet

A diet is a conglomeration of various ingredients in the right proportion to meet the need or requirement of the animal.

Students Assessment Exercise 16.1

What do you understand by a diet?

16.3 Classification of Feedstuffs

Feedstuffs are plant and animal tissues which contain the food elements (nutrients) livestock. There are various types of feeding stuffs available for livestock feeding. These are grouped into different classes on the basis of Botany and chemical composition. These classes are:

16.3.1 Roughages

These are feed materials that are bulky in nature with low weight/unit volume and contain more than 18% CRUDE FIBRE. They are low in energy and proteinous roughages have high content of cell-wall material. In nutritional terms roughages may range from very good nutrient sources (lush young grassland high quality silage) to very poor feeds (straw, hay, stover, chaff, browse etc).

16.3.2 Green (Fresh) Plants

- Pasture
- Silage – fresh green grasses cut and taken to animals
- crop residues – plants which remain green after maturity.

16.3.3 Silage

- Corn (maize)
- Sorghum

16.3.4 Dry Plant Material

- Hay (grass, legume) harvested when plant is still young and dried.
- Straw-mature and probably dried before cutting
- Crop by-products such as maize crops groundnut shell etc.

16.3.5 Concentrate Feeds

Concentrates are feed materials that have low moisture and fibre. Concentrates have a relatively higher content of digestible nutrient.

Concentrates are further classified into:

16.3.5.1 Protein Concentrates

This class of concentrates have a high proportion of protein. They contain more than 20% crude protein. Protein concentrate may be of plant or animal origin.

Examples of concentrate of animal origin are, fish, meal, blood, meal, meat meal, milk powder, shrimp meal, feather meal etc. Animal protein concentrate contain higher amounts and better proportion of essential amino-acids.

Plant protein concentrates contain large amount of protein residue after it has been extracted from oil seeds, fruits or beans by industrial process. Examples are groundnut cake, sunflower meal, coconut meal, cotton seed meal, etc.

16.3.5.2 Energy Concentrates

This group of feed stuffs include cereal grains, roots, tubers and fruits. They are rich in carbohydrates. Next to fat/oils they contain the highest amount of energy per unit weight. They are usually low in proteins ranging from 0.5% in roots to about 10% in cereal grains. Some of the most important cereal grains used in the tropics for feed formulation are maize (*Zea mays*), guinea corn (*sorghum vulgaris*) (*setaris*). Examples of root tubers are cassava (*Manihot esculenta*) potatoes (*Solanum tubersium*) Yam (*Discoria*). Root crops are rich in digestible carbohydrates, low in protein and fibre. Because root crops are bulky and contain high amount of moisture, their use in livestock feed is not widespread.

16.4 Non Protein Nitrogen Compounds As Protein Source

Non-Protein Nitrogen compounds are recognized as useful sources of nitrogen for ruminant. These depends on the ability for the rumen microbes to use them in the synthesis of their unicellular tissues. The most common non-protein nitrogen in use is urea, poultry waste.

16.4.1 Mineral and Vitamin Supplements

These are normally added to livestock diets as supplements. It is important to supplement for minerals in ruminants but vitamins is not necessary since the micro-organisms in the rumen can synthesize most of them.

Mineral supplement can be obtained from animal bone meal. Dickskium phosphate, Rock phosphate, egg shells, Oyster shells etc.

16.5 Characteristics of Feedstuff

16.5.1 Protein Souces

Some of the common proteins sources use in livestock feeding are:

16.5.1 Soya Bean Meal

This is a by-product of Soya bean oil which is the best and most widely use protein supplement. It has a high crude protein value of 44-48%.

16.5.3.0 Groundnut Cake

This is one of the major sources for livestock feed especially in the northern states of Nigeria. The protein value is between 45-47 percentage. It is highly digestible.

16.5.4 Cotton Seed Cake

It is a by-product of cotton seed oil in the industry relatively cheaper when compared to Soyabean meal and groundnut cake.

16.3.5 Palm Kernel Cake (PKC)

PKC contain about 20% protein sunflowermeal, blood meal, fish meal, meat and bone meal, Tankage etc. are also source of proteins.

16.6 Energy Sources

Some carbohydrates, which are notably energy sources are discussed in the following sections.

16.6.2 Maize

This is the main source of energy for livestock. Maize seed has the highest metabolizable energy (ME) of all cereal grains 3442MEKcal/kg.

16.6.2 Sorghum (Guinea Corn)

This is less palatable compared to maize and has a lower metabolizable energy.

16.6.3 Millet

This is a common grain in the drier parts of the country where maize and sorghum do not grow..

16.6.4 Wheat Offal

Residues from wheat milling which includes wheat germ, bran course and fine meddlings which are either produced separately or mixed in some. Wheat Offals have low energy value, but is a rich source of phosphorous and vitamins of the B-group.

Others are:

- Cassava
- Molasses
- Rice Bran
- Fats and Oils
- Oil Seed Sludge

Students Assessment Exercise 16.2

What are the characteristics of rourphages?

16.7 Conclusion

There are several feed materials available for the ruminants, choice of which one to use depends on availability and cost. Farmers are advised to use materials common in their immediate environment which is cheaper.

16.8 Summary

You have studied some of the feed materials commonly used in ruminants feeding. Roughages are offered to ruminants ad lib while concentrates are given as food supplements. Supplements can be in the form of protein or energy or several sources of both are given.

16.9 Tutor Marked Assignment

- What do you understand by the term supplement
- What is a ration in animal feeding
- What are ruminants capable of utilizing non-protein nitrogen?

16.10 References and Other Resources

Bachmann, M. R. The Appropriate Method of Milk Processing in Developing Countries, Centre for Tropical Veterinary Medicine, Edinburgh, U.K.

Payne, W.J.A., 1990. An introduction to animal husbandry in the tropics (4th), Macmillan London

Answers to Students Assessment Exercise S.A.E. 16:1

A diet is a collection of various ingredients in the right proportion to meet the need or requirements of the animal.

Answers to Students Assessment Exercise S.A.E. 16:2

Roughages are feed materials that are:

- (i) Bulky in nature
- (ii) They contain more than 18% crude fibre
- (iii) Have low energy content
- (iv) Have high content of cell-wall materials.