THE REPUBLIC OF UGANDA

Ministry of Education and Sports

HOME-STUDY LEARNING

SENIOR 3

AGRICULTURE

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This material has been developed as a home-study intervention for schools during the lockdown caused by the COVID-19 pandemic to support continuity of learning.

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FOREWORD

Following the outbreak of the COVID-19 pandemic, government of Uganda closed all schools and other educational institutions to minimize the spread of the coronavirus. This has affected more than 36,314 primary schools, 3129 secondary schools, 430,778 teachers and 12,777,390 learners.

The COVID-19 outbreak and subsequent closure of all has had drastically impacted on learning especially curriculum coverage, loss of interest in education and learner readiness in case schools open. This could result in massive rates of learner dropouts due to unwanted pregnancies and lack of school fees among others.

To mitigate the impact of the pandemic on the education system in Uganda, the Ministry of Education and Sports (MoES) constituted a Sector Response Taskforce (SRT) to strengthen the sector's preparedness and response measures. The SRT and National Curriculum Development Centre developed print home-study materials, radio and television scripts for some selected subjects for all learners from Pre-Primary to Advanced Level. The materials will enhance continued learning and learning for progression during this period of the lockdown, and will still be relevant when schools resume.

The materials focused on critical competences in all subjects in the curricula to enable the learners to achieve without the teachers' guidance. Therefore effort should be made for all learners to access and use these materials during the lockdown. Similarly, teachers are advised to get these materials in order to plan appropriately for further learning when schools resume, while parents/guardians need to ensure that their children access copies of these materials and use them appropriately.
I recognise the effort of National Curriculum Development Centre in responding to this emergency through appropriate guidance and the timely development of these home study materials. I recommend them for use by all learners during the lockdown.

Alex Kakooza
Permanent Secretary
Ministry of Education and Sports

ACKNOWLEDGEMENTS

National Curriculum Development Centre (NCDC) would like to express its appreciation to all those who worked tirelessly towards the production of home–study materials for Pre-Primary, Primary and Secondary Levels of Education during the COVID-19 lockdown in Uganda.

The Centre appreciates the contribution from all those who guided the development of these materials to make sure they are of quality; Development partners - SESIL, Save the Children and UNICEF; all the Panel members of the various subjects; sister institutions - UNEB and DES for their valuable contributions.

NCDC takes the responsibility for any shortcomings that might be identified in this publication and welcomes suggestions for improvement. The comments and suggestions may be communicated to NCDC through P.O. Box 7002 Kampala or email admin@ncdc.go.ug or by visiting our website at http://ncdc.go.ug/node/13.

Grace K. Baguma
Director,
National Curriculum Development Centre

ABOUT THIS BOOKLET

Dear learner, you are welcome to this home-study package. This content focuses on critical competences in the syllabus.

The content is organised into lesson units. Each unit has lesson activities, summary notes and assessment activities. Some lessons have projects that you need to carry out at home during this period. You are free to use other reference materials to get more information for specific topics.

Seek guidance from people at home who are knowledgeable to clarify in case of a challenge. The knowledge you can acquire from this content can be supplemented with other learning options that may be offered on radio, television, newspaper learning programmes. More learning materials can also be accessed by visiting our website at www.ncdc.go.ug or ncdc-go-ug.digital/. You can access the website using an internet enabled computer or mobile phone.

We encourage you to present your work to your class teacher when schools resume so that your teacher is able to know what you learned during the time you have been away from school. This will form part of your assessment. Your teacher will also assess the assignments you will have done and do corrections where you might not have done it right.

The content has been developed with full awareness of the home learning environment without direct supervision of the teacher. The methods, examples and activities used in the materials have been carefully selected to facilitate continuity of learning.

You are therefore in charge of your own learning. You need to give yourself favourable time for learning. This material can as well be used beyond the home-study situation. Keep it for reference anytime.

Develop your learning timetable to ca ter for continuity of learning and other responsibilities given to you at home.

Enjoy learning

Term 1

TOPIC 1: LIVESTOCK PRODUCTION

Lesson 1: Introduction to Livestock Production in Uganda

Learning outcomes

By the end of the lesson, you should be able to:

i) identify the common breeds of livestock that are found in Uganda.

ii) describe the importance of keeping livestock to farmers in Uganda.

iii) identify the products of livestock farming.

Introduction

Do you know the number of different animals in your home or village? Well, your guess is as good as anyone else's.

In 2018, the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) indicated that farmers kept 86.4 million livestock in Uganda. Below is a bar graph showing the number of different animals kept by farmers.

In 2019, the Food and Agriculture Organization (FAO) reported that the livestock sector in Uganda contributes about 4.3 percent of the Gross Domestic Product (GDP) and Fifty-eight percent (58%) of Farming households depend on livestock for their livelihoods. Most of them are smallholder farmers.

Photo 1: Summary of the Livestock sector in Uganda (FAO Uganda Report 2019)

All this information shows that Livestock production is key for generation of income and for food security at household level and for the economy at large. It is therefore important for you to learn better methods of production for cattle, poultry, pigs, sheep, goats, fish and bees which are mainly kept in Uganda. This is the only surest way of transforming the somewhat subsistence sector into a strong and vibrant commercial sector.

This makes it important to study issues such as livestock breeds, their methods of production, their reproduction, Nutrition, digestion, sanitation, manure management, biosecurity, disease control, housing, supply chain management, transportation, and record keeping.

Importance of Livestock Production in Uganda
The livestock Sector provides food (e.g. milk, meat & eggs), animals provide raw materials for industry e.g. wool, leather, horns, etc. They produce manure used in gardens. Some animals work and provide transport on the farm e.g. the oxen. They are for recreation and sports. Animals are used for religious & cultural purposes and in some communities owning cattle is social prestige. Lastly, animals are a source of income to individuals through sale of animals/their products and employment on farms. They are a source of revenue to the government through export of livestock products.

Lesson 2: Livestock Nutrition

Learning outcomes
By the end of the lesson, you should be able to:

i) state the importance of nutrition in livestock farming.
ii) categorize the major classes of nutrients in animal feed and their sources.
iii) describe the deficiency symptoms of different nutrients.
iv) prepare a feed ration for selected livestock using the Pearson square.

Overview
Today, one can't turn on the Television or radio or read a newspaper without seeing or hearing or reading information about health issues and Nutrition is the key area of discussion.

Just like in humans, the performance of livestock is greatly influenced by nutrition, genetics and environment. If animals don't have proper nutrition, their growth rate, reproduction rate, immunity, and well-being are all affected.

Without proper nutrition, animals can develop health problems, which could result in treatment costs or even fatality. Animals that do not receive proper nutrition are more likely to develop health and reproductive problems, and be less productive and marketable. Healthy animals help ensure profitability in agricultural operations.

Livestock farmers must understand not only what nutrition an animal needs, but also how to supply that needed nutrition. Farmers must know what ration is appropriate for a specific animal and how to provide a balanced ration. A **ration** is the feed an animal receives over a 24-hour period/a day. A variety of feedstuffs, or basic ingredients, are used in rations, and farmers must choose those that best suit their needs. A ration with all the nutrients an animal needs is a **balanced ration**.

Importance of Nutrition
Nutrition is important for a variety of reasons for instance growth and maintenance, and to provide energy for work and vital functions; maintenance of body temperature, production of milk, reproduction, and development of proper bone structures.

Classes and Sources of Nutrients
In this unit, you will find out the kind of nutrients that farm animals need. Similar to human beings, nutrients in animal feeds are classified into six major classes: water, protein, carbohydrates, fats, minerals, and vitamins. These nutrients can be obtained from various sources including roughages and concentrates. **Roughages** include feed that is high in fibre and low in energy, such as grasses, hays, and silages. **Concentrates** include feed that is high in energy and low in fibre, such as grains.

Water: Animals need a fresh, clean source of water. Most of the water an animal consumes comes from the water it drinks. Water also can be obtained from feed sources such as forage. Water is vital for all animals and makes up more than one-half of most animals' bodies! It forms the basis of fluids in the body and is essential for processes such as digestion, blood circulation, and waste elimination. Water helps dissolve nutrients and also regulates body temperature through perspiration and evaporation. The daily water intake requirement for farm animals is dependent on animal type, size/weight, age, physiology (pregnant, sick etc.), type of feed fed (roughage/concentrate), weather/environment conditions (hot/warm/cold).

Photo 2: A herd of cattle drinking fresh water from a trough

Protein: Protein can be obtained from both plant and animal sources. Plant proteins are more common in livestock feeds and include soybean, cottonseed, and sunflower seed meals. Protein also can be obtained from legume hays such as alfalfa or soybean stover. Sources of animal protein include fish meal, bone meal, meat scraps, and milk products. Proteins are made up of amino acids that are necessary for healthy animals.
Amino acids are the building blocks of protein and are used for the formation of tissues and muscle production. Protein is needed for healthy growth, reproduction, and maintenance.

Animals need different amounts of protein. For example, young, growing animals need more protein than older animals. Protein is often the most expensive ingredient in feed.

Non-ruminant animals must have a dietary supply of essential amino acids (an amino acid that cannot be synthesized by the organism at a rate proportionate with its body demand, and thus must be supplied in its diet.) while ruminants can due to presence of microbes in their rumen synthesize all the amino acids they require.

While referring to proteins, a few terms are used. These include;

a) **Protein quality- the degree to which the protein is utilized by the body**
b) Crude protein refers to the total amount of protein in a feed
c) Digestible protein is the protein that can be digested and used by an animal.
d) Biological value- the proportion of the protein that is absorbed and retained in the animal's body.
e) Protein Efficiency ratio- the ratio of weight gain over protein intake.

Cotton seed cake

Fish Meal

Sun flowet

Soybean meal

Carbohydrates: Carbohydrates come from plants and include sugars, starches, and cellulose. The main sources of carbohydrates in feed are forages, hay, grains such as corn, oats, wheat, barley, rye, and grain sorghum. They provide the main source of energy for activities the animal body performs. Carbohydrates provide energy for growth, maintenance, and reproduction. They also help produce body heat for warmth. Carbohydrates are the cheapest ingredient of animal feed. Carbohydrates are classified into 3 classes. The **Monosaccharide (**carbohydrates made up of one unit of simple sugar e.g. glucose, fructose and galactose, the **Disaccharide (**carbohydrates made up of two units of simple sugars e.g. sucrose & lactose) and **Polysaccharide (**carbohydrates made up of many units of simple sugars e.g. cellulose & starch)

Photo 3: Young heifers feeding on hay

Animals feed on materials humans cannot eat to produce highly nutritious food products for mankind.

Fats (Lipids & Oils): Many sources of proteins are also sources of fats. Fats are found in both plants and animals. Plant fats include oils that are within seeds, which are the main source of fats in agricultural feeds. Fats in livestock diets are needed in very small amounts but they are a necessary (essential) part of the diet. Fats are made up of carbon, hydrogen and oxygen just like carbohydrates but fats have more carbon and hydrogen. Fats provide energy and store excess energy. Fats help produce body heat and carry fat-soluble vitamins in the body.

Minerals: Minerals are often added to animal feed or fed **free choice**, which means animals are able to access them at any time. For example, salt and mineral blocks are fed free-choice where animals are able to lick them anytime they want. Minerals provide material for growth of bones, teeth, and tissue and help regulate many of the body's chemical processes. Minerals also help in muscular activities, reproduction, tissue repair, and body heat. Although mineral intake may account for a small portion of the total diet, it is essential. Minerals are categorized as macro-minerals or micro-minerals.

Macro-minerals are needed in larger amounts by the body, and **micro-minerals** are needed in smaller amounts. Macro-minerals include calcium, chlorine, magnesium, phosphorus, potassium, sodium, and sulphur. Micro-minerals include chromium, cobalt, copper, fluorine, iron, iodine, manganese, molybdenum, nickel, selenium, silicon, and zinc.

Animals may be able to tolerate minerals in excess of recommended quantities; however, excess minerals in some species can cause toxicity, even leading to death. Farmers should always ensure that minerals are given in the appropriate amount to animals. Excess of some minerals can cause weight loss and slower rates of gain in some animals. Pigs that are given excess minerals may have slower gains, and cattle that have an excess of sodium and chloride can have reduced milk production and weight loss. An excess of some minerals may also interfere with the metabolism of other minerals. For example, sulphur toxicity in cattle can interfere with the metabolism of selenium, copper, molybdenum, and thiamine.

Vitamins: Vitamins can be obtained from many different sources such as forages, hay, and cereal grains. Just as in minerals, it is important for the producer to provide the appropriate vitamins. Vitamins are essential for normal body functions such as digestion, cell metabolism, growth, and reproduction. Like minerals, they are also needed in relatively small quantities. Vitamins help in tooth and bone formation, assist the body in fighting stress, and prevent infection in the body.

Vitamins are fat soluble or water soluble. Water-soluble vitamins are dissolved in water, and fat-soluble vitamins are dissolved in fat. Fat-soluble vitamins include vitamins A, D, E, and K. Vitamin D is necessary for bone development, and it is produced in the animal's body. In order to produce vitamin D, the animal must be in sunlight for a portion of the day. Some of the main benefits of the other fat-soluble vitamins include blood clotting (vitamin K), reproduction and muscle development (vitamin E), healthy eyes, and preventing infection (vitamin A).

Water-soluble vitamins include vitamin C and the B-complex. Vitamin C is needed for teeth and bone formation, and the prevention of infections. B-complex vitamins are necessary for growth and reproduction. The B-complex vitamins include thiamine, riboflavin, niacin, pyridoxine, pantothenic acid, biotin, folic acid, benzoic acid, choline, and B-12. The B-complex vitamins help many body functions such as red blood cell maturation (vitamin B-12) and energy metabolism (riboflavin).

Symptoms of Nutrient Deficiencies

What happens when an animal doesn't get enough of a specific nutrient? Symptoms of nutrient deficiencies range from a variety of diseases and health problems to fatality.

The symptoms of water deficiency include weakness, reduced feed intake, weight loss, eyes that appear sunken in, and lack of saliva production. Water deficiency can ultimately cause death if the animal does not receive adequate amounts of water.

Lack of energy is often a first symptom of carbohydrate deficiency. Other symptoms of carbohydrate deficiency include weight loss, poor growth rates, loss of fat, and an unthrifty appearance. Animals that lack carbohydrates for an extended time can face starvation and possibly death.

Fat deficiencies are not common in agricultural animals but may occur in poultry. Symptoms in poultry include reduced growth and reproductive performance.

Symptoms of protein deficiency include decreased growth and development, reduced feed intake, body tissue loss, poor hair coat, poor hoof growth, decreased physical endurance, infertility, and decreased milk and egg production.

Mineral deficiencies in animals can cause a wide range of problems from rickets and deformed bones (due to lack of calcium) to joint stiffness (due to lack of potassium).

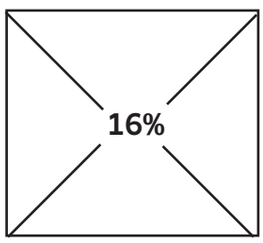
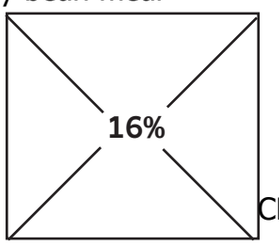
Like mineral deficiencies, vitamin deficiencies in animals can cause a wide range of problems, as well. They can result in vision problems (lack of vitamin A) to bone weakness (lack of vitamin D).

Feed Additives
Do you know why a cook or chef adds ingredients such as curry powder, salt, tomatoes, onions, mayonnaise, black pepper and many others while preparing a meal? Well it's to get a better aroma and taste for the consumer. For farmers to be efficient and produce marketable products while maintaining costs, they must use feed additives in their feed rations.

Feed additives are added to an animal's feed for growth acceleration, increased feed efficiency, increased production of animal products, or health maintenance improvement. Feed additives are not usually considered a nutrient source.

Two major categories of feed additives are growth regulators and antibiotics. **Growth regulators** are hormones that increase growth rates and feed efficiency. **Antibiotics** are used as a feed additive for the prevention and treatment of diseases and infections such as scours, coccidiosis, and foot rot. Antibiotics may be used at low levels to improve efficiency and growth. Other uses of feed additives include bloat control in ruminant animals, stress reduction by adding tranquilizers, pH level regulation, and fly control.

The Pearson Square
Producers must balance rations to be efficient and ensure an animal receives the proper nutrients. There are various methods of balancing rations such as using computer software or hand calculations. Regardless of the method used, one must know the animal's nutritional needs and the nutrient analyses of the feed to determine a balanced ration. One of the most common methods of balancing rations is by using the Pearson Square. The Pearson Square method is used to determine the portions of two feedstuffs required to obtain a desired nutrient composition for a ration. Only two components can be used in the Pearson Square, although the components can be a mixture.

Person Square Steps	Illustration
Step 1. Write the number in the middle of the square that represents the nutritional requirement of the animal. The nutritional requirement for the animal may be crude protein or TDN, amino acids, vitamins, or minerals. For this example, crude protein (CP) is being calculated. **Step 2.** Write the two numbers on the left that represent the feedstuffs (ingredients) used to make the ration. The number in the middle of the square must fall between the numbers on the left.	45% CP Soybean Meal 10% CP Maize 
Step 3. Subtract the nutrient value on the left from the nutritional requirement in the middle disregarding any negative. **Step 4.** Add the feedstuff parts together	45% CP 6.0 parts Soybean Meal Soy bean meal (10-16)  CP Maize Maize (45-16) 6.0 Parts Soybean Meal + 29.0 Parts maize 35.0 Total Parts
Step 5. Divide the ingredient for which you want to know the ration by the total parts. Multiply by 100 to determine the percentage. Round if necessary.	6.0 ÷ 35.0 = 0.17 x 100 = 17% Soybean Meal 29.0 ÷ 35.0 = 0.83 x 100 = 83% maize 100%
Step 6. To determine the amount of each feed ingredient, multiply the percentage of each ingredient by the total amount of feed desired. In this example, 1 ton of feed is needed.	1,000 x .17 = 170kg. Soybean Meal 1,000 x .83 = 830kg. Corn

Activity;Using the Pearson Square method, formulate a 10kg feed mixture that is 16% protein ration for your 10 chicks using maize bran which 8% protein and cotton seed cake which 32% protein.

Lesson 3: Digestion in Farm Animals

Learning outcomes

By the end of the lesson, you should be able to:

i) identify a non-ruminant and ruminant animal.
ii) describe the digestive process in non-ruminants and ruminants.

Introduction

Digestion is the process of breaking down feeds into simple substances that can be absorbed into the bloodstream and used by the body's cells. It is important for farmers to understand the digestive process because it helps them in selecting the proper feed for the animal's type of digestive system.

The **digestive system** is the system in which food is acted upon through physical (chewing) and chemical (stomach acids and enzymes) means. It includes all parts from the mouth to the anus. On the basis of the digestive system, farm animals are classified into; monogastric animals (non-ruminants) and polygastric (ruminant) animals. Monogastric animals have a single stomach just like humans and these include; pigs, chicken, ducks, turkeys, rabbits, horses etc. Polygastric animals have four stomach chambers and these include; cattle, goats, sheep etc. Non-ruminants are better adapted to processing and utilizing concentrated feeds such as grains while ruminants have a greater ability to process and utilize large quantities of bulky roughages because of their rumen. Understanding the digestive system can help the farmer become more efficient in feeding, resulting in a more cost-effective livestock enterprise. It also helps the farmer have a better understanding of animal health and problems that may occur. Understanding the chemical and physical changes that take place after an animal eats is important in noticing health problems related to digestion.

Digestion in Ruminants (Cattle, sheep & Goats)

All ruminants have the same digestion process with the first step in the digestive process occurring when feed is taken into the mouth and chewed just enough to make swallowing possible. The feed then moves down the oesophagus to the rumen, where it is acted on by millions of microorganisms. A portion of this feed, in the form of a bolus (cud), is forced from the rumen back into the mouth where it is re-chewed and re-swallowed.

The feed then returns to the rumen and reticulum for further storage and action by microorganisms (microbes). The feed then moves to the omasum, where water is squeezed from the food and then on to the abomasum (true stomach) where it is mixed with digestive juices. From the abomasum, feed moves to the small intestine where the digestible portion of the feed is absorbed. The un-digestible portion of the feed moves on to the large intestine and is formed into faeces. The faecesis stored in the rectum and expelled through the anus.

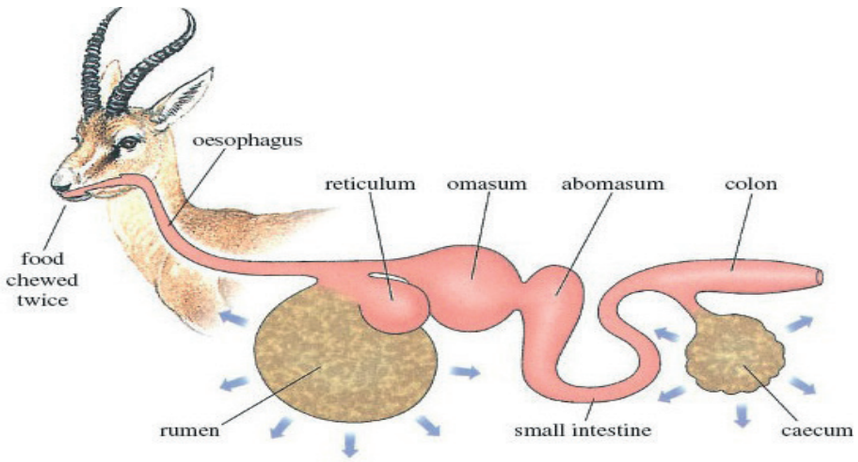


Photo 4: The digestive system of *a goat* (ruminant *animal*)

Digestion in Non-ruminants (horses, rabbits, pigs, dogs, and poultry)
The digestive process of non-ruminants also called mono gastric begins when feed is taken into the mouth, chewed, and mixed with saliva. The feed then moves down the oesophagus to the stomach where it is churned and mixed with digestive juices. The feed then moves into the small intestine where most of the digestible portion is absorbed. After the small intestine, feed moves to the cecum. In animals with a functional cecum, additional digestion and absorption takes place. In animals with a non-functional cecum, feed moves on through the digestive system. After feed moves through the cecum, the undigested portion of feed moves into the large intestine, where water is absorbed and the rest of the feed is formed into faeces. The faeces are stored in the rectum until it is expelled through the anus.

The digestive process of the avian (poultry) system begins when feed is taken into the mouth. The feed immediately moves down the oesophagus to the crop where it is stored and soaked. The feed then moves to the proventriculus (true stomach) where it is mixed with digestive juices. From the proventriculus the feed moves to the gizzard where it is crushed and ground. Then the feed moves through the small intestine, ceca, and large intestine where it is absorbed or formed into faeces. The faeces are expelled through the vent.

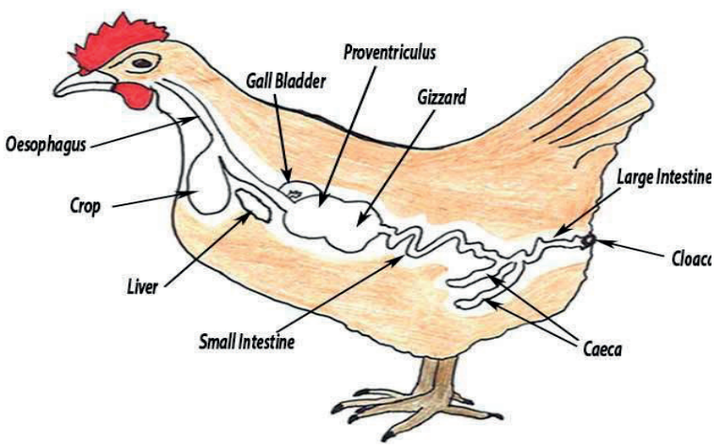


Photo 5: The digestive system of *a* chicken (non-ruminant *animal*)

Activity:

1. Make a list of all animals kept by farmers in your community. Classify them as ruminant and non-ruminants
2. Visit a slaughter house in your Community and make an observation of a cow's digestive system. Write down your observations.
3. Make a mule of the digestive system of a chicken. Be as creative as possible. Present your project to your teacher whenever school resumes.

Lesson 4: Introduction to Farm Animals

Learning outcomes

By the end of the lesson, you should be able to:

i) describe the current trends about livestock production.
ii) do an enterprise selection in regard to livestock farming.
iii) develop a small-scale investment plan for a selected livestock. enterprise
iv) undertake a livestock farming project at home.

Cattle Production

Cattle are the most important livestock sub-sector in Uganda. According to Uganda Bureau of Statistics (UBOS), the country has 14.2 million cattle, of which 13.3 million are indigenous breeds. Out of the national herd, 11.9 million cattle are raised for meat.

Keeping of cattle provides income, food, draft power, insurance and savings, social capital& social prestige and other goods to the farmer. In some communities, for example the Bahima and Karamojong regard cattle as a measure of wealth and social prestige. The cows are used to pay dowry and perform other religious and cultural functions. Therefore, we gain numerous benefits from animals and as a young person, your involvement in the keeping of cattle and development of the sector is of great value.

Breeds of Cattle

In Uganda, we keep two species of cattle i.e. **Bostaurus**(Exotic breeds) which came from Europe, Asia and America. They are humpless, produce large quantities of milk, have a high ability of converting feeds into meat and mature early & grow faster.

Examples of Exotic breeds include;

i) Dairy breeds (Friesian, Ayrshire, Jersey, Guernsey, Brown Swiss),
ii) Beef breeds (Aberdeen Angus, Hereford, Charolais, Galloway etc.) and
iii) Dual Purpose breeds which are good for both milk and beef (Sahiwal, Red Poll, Simmental etc.).

The other species are the **Bosindicus**(Local Breeds) that have been reared in East Africa for many centuries. These mainly include; the Zebu cattle that are divided into 2 subgroups i.e.

i) Boran
ii) Small East African Zebu

Zebu cattle are tolerant to tropical conditions, walk very long distances, are small in size and produce little milk but with a high butterfat content.

Production of Small ruminants (Goats & Sheep)

a. **Goats**

In 2018, it was reported that 16 million goats are kept in Uganda. These include both the exotic and local breeds but the local breeds make up the largest proportion of the goats' population in the country.

Many young people raise goats because it is cheaper to acquire and maintain a goat. Goats can live on scanty vegetation, and the enterprise is lucrative and enjoyable. Goats are kept mainly for meat although milking goats and goats for hair have been introduced in Uganda.

Just like cattle, goats have exotic and local breeds.

i) Local breeds include; Small East African goat, Mubende goat and Kigezi goat.
ii) Exotic breeds include;
   a) Meat breeds e.g. Alpine goat, Anglo-Nubian goat and Boer
   b) Milk Breeds e.g. Saanen, Toggenberg and Jamnapari
   c) Hair (mohair) producing breeds e.g. Angora goat

b. **Sheep**

In Uganda, sheep are among the least kept farm animals with a population of 4.5 million sheep. Sheep rearing is not so popular in Uganda despite the low investment requirements. This is because the consumption of mutton by Ugandans is quite low hence there is less demand driving the farmers to keep sheep. There are exotic and indigenous breeds of sheep. The sheep are kept for;

i) Mutton & fat e.g. Merino, Dorper, Dorset, Romney Marsh/Kent, Masai, Somali, black-headed Persian
ii) Wool production e.g. Hampshire Down, Suffolk
iii) Dual purpose e.g.Corriedale, Texel, Coopworth

Production of non-ruminants (pigs & chicken)

a. **Pigs**

Currently, pig production is one of the key livestock enterprises that attract a lot of investment from young people. We have 4.1 million pigs in the country which are mainly kept in sty's, in-door facilities and outdoor. Many of the pigs reared in Uganda are exotic and are reared for either **pork** (pig meat from a young pig weighing 45-50 kg at 4 months old) or **bacon** (pig meat from an old pig weighing 110-120kg and slaughtered at 7-9 months) production. Pigs also provide bristles used for making synthetic leather fabrics and fat used in the manufacture of soap and margarine.

Pig breeds kept in Uganda include; large white, Landrace, Wessex Saddle Back, Duroc, Camborough, large Black, Hampshire (which are late maturing), Berkshire & middle White (which are early maturing).

b. **Poultry (**chickens, ducks & turkeys etc.)

Poultry refers to domesticated birds such as chickens, ducks and turkeys. In Uganda we have 47.6 million birds kept by 2.7 million households (many households keep chickens, largely on a free-range system). Of these, chickens are the most popular and are reared mainly for meat and eggs. Farmers keep both local and exotic breeds. Some breeds are for laying eggs (egg producers), others are for meat production (broilers) while others are for producing both eggs and meat (Dual purpose breeds).

Activity

1. Survey your community and identify the animals reared by your community members
2. Ask them what they considered when choosing their livestock enterprise
3. Ask them what benefits have they got from raising their livestock
4. Ask them what challenges do they face while raising their livestock enterprise
5. Recommend strategies to address the challenges mentioned above
6. Write your findings in your revision book of Agriculture

Lesson 4: Introduction to Poultry production

Learning outcomes

By the end of the lesson, you should be able to:

i) identify the categories of poultry kept in Uganda.
ii) describe the requirements for starting and raising a poultry enterprise.
iii) manage a poultry production project.

Poultry Production

A religious, cultural or social celebration without chicken on the menu would hardly be a celebration! Imagine a birthday party, cultural introduction ceremony, wedding, Christmas, Eid or Easter without chicken, the celebration would not be complete.

Poultry Production systems

There are three major chicken production systems in Uganda: intensive, semi-intensive and extensive (free-range production systems).

1. **Intensive system**
   In intensive production systems, farmers keep a few to hundreds of thousands of exotic chickens, either broilers or layers. The birds are permanently housed in structures such as cages or deep litter houses. Strict parasite and disease control measures e.g. following strict vaccination schedules and regulating visitors are observed at all times. Water, feeds and laying nests/boxes are provided indoors. Intensive chicken farms are common in peri-urban areas. Examples include; Ugachick Poultry Farm, Biyinzika Poultry International, Blue Bird Poultry and many others. In Uganda, 2 main intensive production systems are used. These include;

i) Deep litter system where birds are kept in a house whose floor is covered with litter
ii) Battery cage system where one to four birds are kept in a single cage.

2. **Semi-intensive**
   In semi-intensive production systems, farmers keep flocks of layers, broilers, dual purpose or local birds. The birds are housed in basic structures with litter materials (coffee husks, wood savings etc.) spread on the floor; feed troughs; drinkers and laying boxes. However, the birds are sometimes allowed to roam outside but within an enclosed place. They are given water, some compound feeds and usually vaccinated against major poultry diseases, such as Newcastle, Gumboro, Fowl typhoid and Fowl pox.

3. **Free-range (Extensive system)**
   In this system, farmers keep from one to dozens of indigenous chicken, which freely scavenge for food and parch at night in poultry house. Sometimes, a few exotic or dual purpose breeds are also kept. Parasite and disease control measures are given less attention. Birds produce both eggs and meat for the household. Occasionally, farmers sell live birds that are well valued in the market because consumers have a preference for local breeds. The free-range system is common throughout the country.

Free Range system

Deep Litter System

Battery Cage system

Incubation and Hatching of eggs

Many young people own hens from which they obtain fertile eggs for hatching. In rural areas, young farmers use the broody hen to incubate 10-15 eggs for 21 days (**natural incubation**) for their small scale poultry enterprise. For established farmers, they obtain their day old chicks from a sales outlet after booking for them while other few farmers have their own hatcheries or incubators of different types and sizes (**artificial Incubation**).

In both methods of incubation; the eggs selected should be fertile, clean, have a normal shape and size and should have been stored in a relatively cool place.

Natural Incubation

Artificial Incubation

Lesson 6: Management of Poultry Flock

Learning outcomes

By the end of the lesson, you should be able to:

i) identify the different growth stages of chicken.
ii) describe the process of brooding chicks.
iii) effectively manage chicks, growers & layers.
iv) collect, sort, grade & store eggs.

Management of Day-Old chicks and Brooding

When carrying out a commercial poultry enterprise, a farmer starts with day old chicks. It is important that you buy a stock of good quality. On the day of arrival, the day old chicks are put in a special house called a **brooder** where they are kept until they mature.

1. Preparation of the brooder
   The brooder should be prepared to receive chicks well in advance and the following activities are done:
   i) The walls & floor of the brooder, feeding and water equipment are scrubbed and disinfected,
   ii) Litter is put on the floor and covered with paper to prevent the chicks from eating it.
   iii) A chick guard rail is provided and the drinkers and feeders are arranged well in the room ensuring that there is enough space for all chicks.
   iv) A heat source is provided 2 days before the chicks are introduced into the brooder house.
   v) On arrival, the chicks are counted and are provided with water mixed with glucose to boost their immunity.

2. **Caring for chicks in the brooder**

The management and care for young chicks is called **brooding.** Young chicks require good housing and temperature regulation for their normal growth. In a brooder, chicks should be provided with enough warmth, adequate light, good feeds, clean water, and clean litter and should be vaccinated against several viral diseases.

Management of Growers & Layer birds

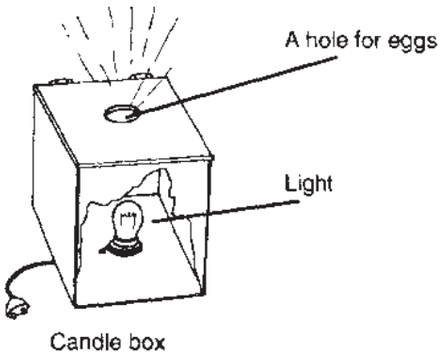
After six weeks of brooding chicks, they become growers. These are transferred to a new house where they grow into pullets. Growers are fed on growers' mash or pellets until when they start laying. At the start of laying, they are fed on layers' mash or pellets. Laying birds are provided with green vegetables and some little sand to give them minerals and grit respectively. The farmer should continue carrying out routine vaccination, regular deworming, maintaining good hygiene in the house and feeding the birds on compound feeds. Birds should be debeaked and provided with laying nests before they start laying.

Egg collection & Storage.

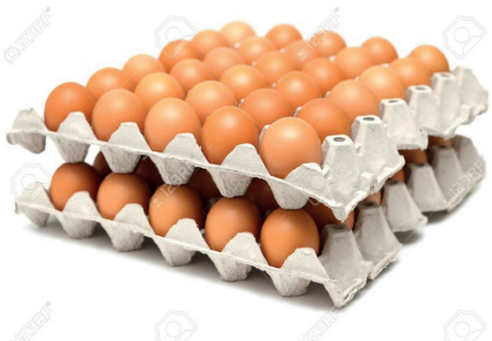
The ultimate goal of raising Layer birds is to get marketable eggs.
It is thus important to;

i) have clean nests in the poultry house.
ii) collect eggs thrice a day.
iii) use trays to collect eggs.
iv) Store eggs after wiping them with a damp cloth (do not wash eggs).

Before taking eggs to the shop or market, they should be examined using an **Egg Candler** to check for any internal abnormalities for instance, blood spots & meat spots. Other abnormalities include; soft shelled eggs, thin shelled eggs, abnormal colour & smell of the yolk, double yolk and cracks in the egg shell. After egg collection & examination, the eggs are packed in egg trays with their wide part on top and stored in a cool room.



A Candling box



Eggs on a tray

Lesson 7: Parasites & Disease Control in Poultry

Learning outcomes

By the end of the lesson, you should be able to:

i) identify the different parasites and diseases that affect chicken in Uganda.
ii) understand the classification of parasites.
iii) describe the symptoms of different diseases in chicken.
iv) control parasite and diseases using a defined protocol on a chicken farm.

General Methods of controlling poultry Parasites & diseases
Poultry are affected by many parasites (organisms that feed on other organisms). These parasites affect birds in different ways such as causing irritation and discomfort, sucking blood, transmission of diseases and using of food nutrients provided to the bird. Parasites can be Endo or Ecto-parasites and they are prevented & controlled by deworming the birds and dusting the poultry house respectively. In regard to diseases, they are a major problem in poultry production. This makes it of great value to carry out regular vaccination, isolate sick birds, cull infected birds, disinfect the poultry house regularly, maintain hygiene in the house and ensure strict biosecurity measures are put in place. Poultry diseases include; Newcastle, Gumboro, Coccidiosis, fowl typhoid, fowl pox and many others.

Activity
Now that you have learnt about poultry production, visit a poultry farm near your home and undertake the following assignments.

Write your findings in note book.

1. Write down the type of poultry kept and its breed
2. Participate in feeding and putting water in the poultry house and do the following:
   a) Mention the type of poultry production system used.
   b) Write down the number of birds kept on the farm.
   c) Currently, what type of feed is used to feed the birds?
   d) What is the daily amount of feed given to each bird? Use it to determine the quantity used to feed the entire flock on a daily basis.
3. List at least 2 major poultry diseases and parasites that affect their chicken
4. Ask for the different records used on the farm and draw the sample formats in your revision book.

Lesson 8: Introduction to Cattle Production

Learning Outcomes

By the end of the lesson, you should be able to:

i) state the production systems of cattle (dairy & beef).
ii) identify different breeds of dairy and beef cattle kept in Uganda.
iii) give advice on the requirements for starting and raising a cattle farm.
iv) describe the importance of cattle farming to farmers & the economy.

Cattle production systems
In our introductory notes, we talked about the facts of cattle production in Uganda and listed the different types of cattle kept highlighting the major breeds. In this section, our focus will be on the systems of production, making of animal feeds, animal nutrition, housing, breeding, disease & parasite control and carrying out of other management practices.

There are four cattle production systems in Uganda: the commercial ranching/ intensive system, pastoral, agro-pastoral and semi intensive production systems.

i) **Pastoral system**
In the pastoral or free-grazing production system, farmers move cattle from place to place in search of pastures and water. They keep indigenous breeds with a few animals. The main products are beef, milk, blood, hides, manure and horns. This system is dominant in the Karamoja region and in many areas of the cattle corridor.

ii) **Agro-pastoral system**
In this system, farmers keep indigenous cattle that graze both on private and public pastures. They also feed them with crop by-products. Cattle produce beef and milk, hides, manure and horns and provide draught power. Investments to improve productivity, including in animal health, are none to minimal. This system is present in the Eastern, Central, Western, North and West Nile Sub-regions.

iii) **Intensive system**
In this system, farmers keep hybrid and pure exotic dairy cattle in zero-grazing houses, paddocks and cattle barns, free feeding stalls and feed them with high-quality feed. Farmers make significant investments in animal health, such as regular vaccination and deworming. In intensive system of dairy production; cattle are graded according to their physiological state and kept in separate facilities including calf pens, paddocks and large barns. Farmers make significant investments in feeding and health to maintain animals in good health. Cattle produce mainly for milk production. This system is mainly found in peri-urban areas of Central and the Western regions.

iv) **Commercial Ranching**
This system of production is a market-oriented for milk and beef production respectively. In Uganda, ranches are mainly owned by the government for beef production purposes. Large cattle herds are normally kept. In commercial ranching of beef cattle, animals graze during the day in fenced areas and are often paddocked in one central paddock at night.

Lesson 9: Management practices in cattle production

Learning outcomes

By the end of the lesson, you should be able to:

i) define the general management practices in cattle production.
classify the different feeds for cattle.
ii) describe the importance of housing cattle and know different. farm structures needed on a cattle farm.
iii) identify the signs of heat in cows.
iv) describe the process of producing clean milk on a farm.

Introduction

Animal management practices includes feeding, housing, breeding, health management, identification, castration, dehorning, culling, grooming, hair clipping and hoof trimming. Identification involves use of ear tags, tattoos, brands, or microchips so that ownership or heredity of an animal may be identified. Dehorning is used to remove horns from cattle, different methods are applied when dehorning. For animals to grow and be in position to produce large quantities of milk and meat, the farmer must invest heavily in all the mentioned animal management practices.

Feeds & Feeding of Cattle

Dairy and beef cattle have inherited genetic potential for performance. How well that potential is realized depends on the environment of the animal and nutrition (feeding) is the most important environmental factor.
Cattle need minimum daily amounts of good feed and unlimited access to fresh &clean water to function, grow and produce. The minimum daily feed allowance is dependent on the physiological state of the animal. Cattle have three physiological body processes requiring food energy. These include;

i) maintenance for body activities that go on as long as an animal has life such processes include heartbeat, respiration etc. with no weight gain or loss
ii) live-weight change for the growth phases of the animal
iii) Production processes such as reproduction, milk & meat production etc.

Good feeding with adequate and balanced diets helps to keep cattle healthy. Feeds for cattle are classified as roughages (feeds mainly of plant origin like pastures, green fodder, hay & silage), Concentrates which can be energy or protein concentrates (they are factory processed and have a high concentration of nutrients). Examples of concentrates include; by-products of cereal processing, fishmeal, seed cakes of legume processing, by-products of cooking oil processing etc. Supplements which are feeds that improve the nutrition value of a ration. Supplements may be fed alone or mixed with other feedstuffs to make a complete feed. Examples of supplements include; mineral blocks, premixes etc.

Photo 6: Students learning about dairy cattle at their school Farm

Housing

Cattle especially dairy cattle require comfortable housing facilities for accommodation of young stock (calves), heifers, dry cows and milking cows. Such structures include both simple and modern housing units. In Uganda, many dairy farmers especially those in peri-urban centres use simple wooden zero grazing structures to provide shelter for their cattle. Other medium scale and large-scale farmers use small to large barns or free-stalls respectively for feeding and accommodation of their animals.

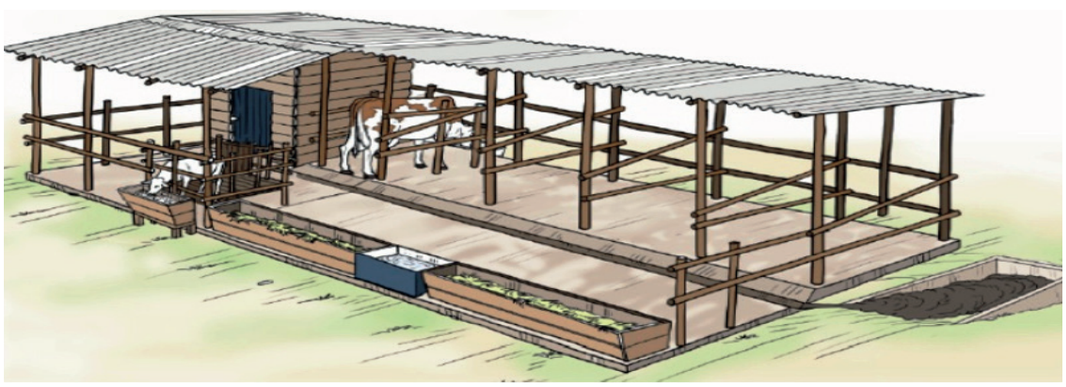


Photo 7: A zero grazing unit complete with a sun shade structure (source: Kenya Ministry of Agriculture)

Breeding

Breeding refers to the manipulation of genetic make-up of animals so as to get desired offspring. Animal breeding (Livestock improvement) leads to creation of new breeds with desired characteristics (traits) such as increased milk production, resistance to environmental stress, docility, early & quick maturity in cattle. There are various breeding methods such as Inbreeding (mating of closely related animals i.e. Sister X Brother), Line breeding (mating of relatives i.e. half-brother X half-sister), out breeding (mating of unrelated animals but of the same breed) and Cross breeding (mating of animals belonging to different breeds i.e. a zebu cow X Friesian bull). Each method has its advantages and limitations.

For cows to be bred, a farmer decides between two breeding types i.e. natural mating where a bull is used. Natural mating is commonly used in beef production but this makes it hard to keep breeding records. Artificial insemination (AI) where semen is introduced into the cow's reproductive using equipment, this is common in dairy production. When using artificial insemination, a farmer looks out for heat signs in their heifers and cows. The time between one heat and the next is usually 21 days and it is called heat cycle.

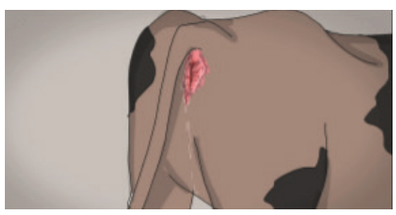
Signs your cow is on heat

Cow is restless

Bellows often

Give less milk

Swollen vulva and clear discharges are the most important



Allows itself to be mounted and mounts others

After conception, your cow or heifer will be pregnant for 9 months and towards the end of the pregnancy; the dairy heifer/ dairy cow should be dried off and steamed up for the upcoming lactation phase. The farmer should also look for signs of calving which include; enlargement of the vulva, slimy discharge from the vulva, enlargement of the udder, relaxation of the tail ligaments, staying alone and lying down and becoming restless and nervous.

Clean milk production

Good hygiene of the udders, the milker and the milking equipment results into a healthy cow, good quality milk and healthy consumers and yields more money when milk is sold. On the other hand, bad milking hygiene results in sick cows, contaminated milk and risk consumers getting sick from the milk and its products and results into less money when the milk is sold.

During the hand milking process, the milker has to undertake a step by step process in order to produce clean milk.

The steps for clean milk production are:

i) Wash your hands with clean water and soap
ii) Clean the udder with water and a clean towel. Use a fresh towel for every milking cow.
iii) Hold the teat by wrapping your thumb and forefinger around the base of the teat. Add your middle finger and squeeze gently to press the milk out of the teat.
iv) Check the first drops of milk for mastitis using a strip cup
v) Repeat step (iii) and compress the other fingers against the rest of the teat. Do this until there is no more milk in the udder. Avoid pulling the teats.
vi) After milking, weigh and record the milk produced by each cow.
vii) Sieve the milk to remove any debris and keep it in an appropriate container
viii) Clean the milking place and equipment using water and soap thoroughly.

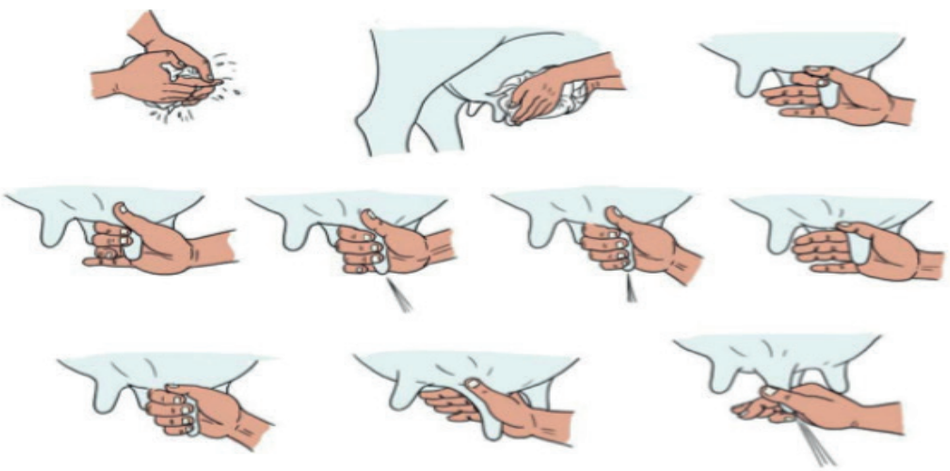


Photo 8: The illustration of a step by step process of hand milking

Activity

1. Visit a dairy farm in your community and observe their milking process. Write down recommendations for their improvement in hand milking.
2. Ask for permission from the farm owner or manager to practice hand milking. Write down the process you undertake to produce clean milk.
3. Interview the farm owner or manager, to find out; their breeding methods, the feedstuffs used on their farm and animals' feeding regime.
4. Move around the farm and identify the animal's housing facilities on the farm. Write them down.

Parasite & Disease Control in Cattle production

Like humans, cattle get infected by parasites and diseases. Actually, some diseases that affect human beings also affect animals. These diseases are referred to as Zoonotic diseases. A farmer needs to promote good health among his/her animals for them to be in position to produce large quantities of milk and meat. Ill animals fail to perform to their potential and may die if not treated well.

Cattle suffer from different diseases which may be **contagious disease** (viral, bacterial, fungal, protozoan or parasitic diseases) or **non-contagious disease (***a* disease due to nutritional deficiency, physiological defect or morphological disorder).

In any farming system, it is better to prevent health problems than treat them and there are various practices that can be undertaken to achieve biosecurity (prevention of parasites and diseases) on a farm.

Practices that promote biosecurity in cattle production include;

i) restricting movement of visitors

ii) preventing your animals from interacting with other herds

iii) using overalls on a farm, disinfection of all visitors, clearing bushes and pruning trees on the farm

iv) vaccination of your animals

v) regular spraying and deworming of your animals using a recommended acaricide and dewormer.

When spraying, spray early in the morning before animals get thirsty to minimize ingestion of insecticide. A useful rule to remember is – do not spray in the heat of the day, spray before 9.00 am when the sun is not hot. Hold the nozzle of the spray pump at a distance of 30cm (1ft) from the animal and then spray the body parts in the order presented in the photograph below.

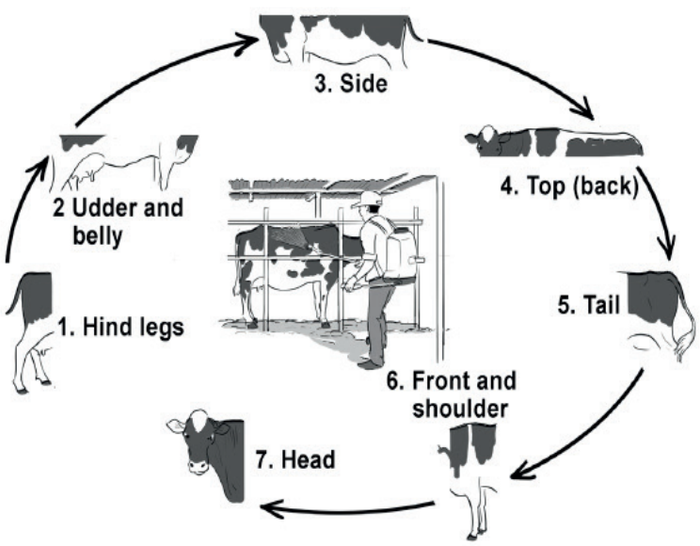


Photo 9: procedure of spraying animals against ecto-parasites like ticks

In Uganda, cattle mainly suffer from tick borne, bacterial and viral diseases. When an area is affected by a deadly viral disease (Foot and Mouth Disease FMD, Lumpy Skin Disease LSD) or a bacterial disease (Anthrax, Contagious Bovine pleura- pneumonia CBPP) it is quarantined and movement of animals and their products restricted. Other major diseases that affect cattle include; East Coast Fever ECF and Anaplasmosis. To prevent economic losses of cattle some of these diseases are vaccinated by the individual farmer or by the government.

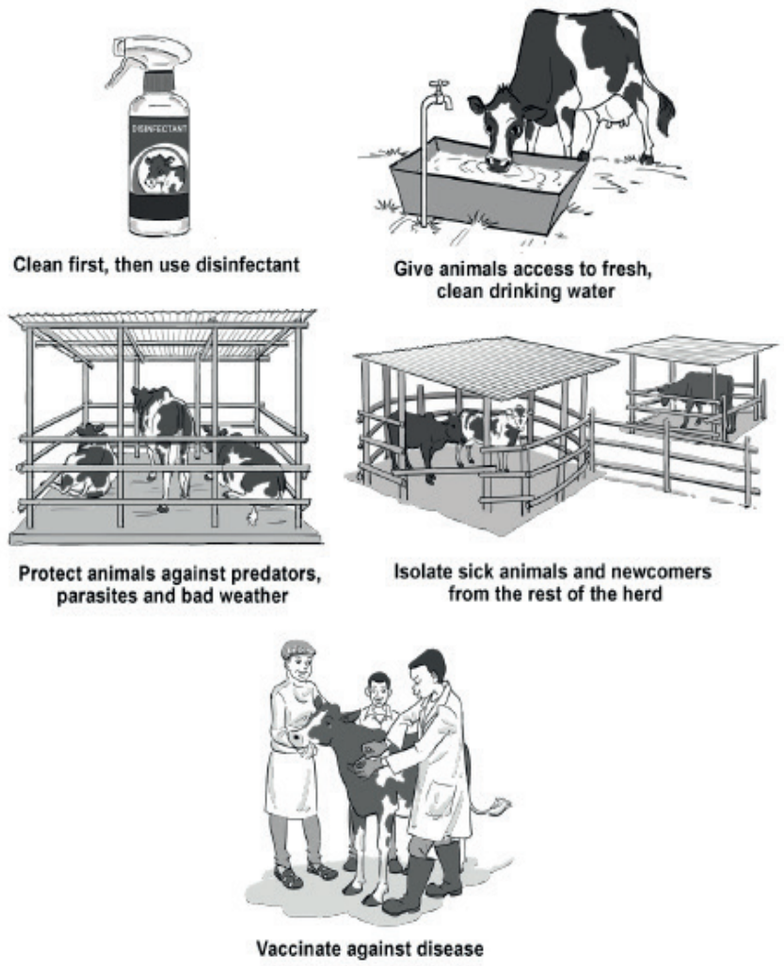
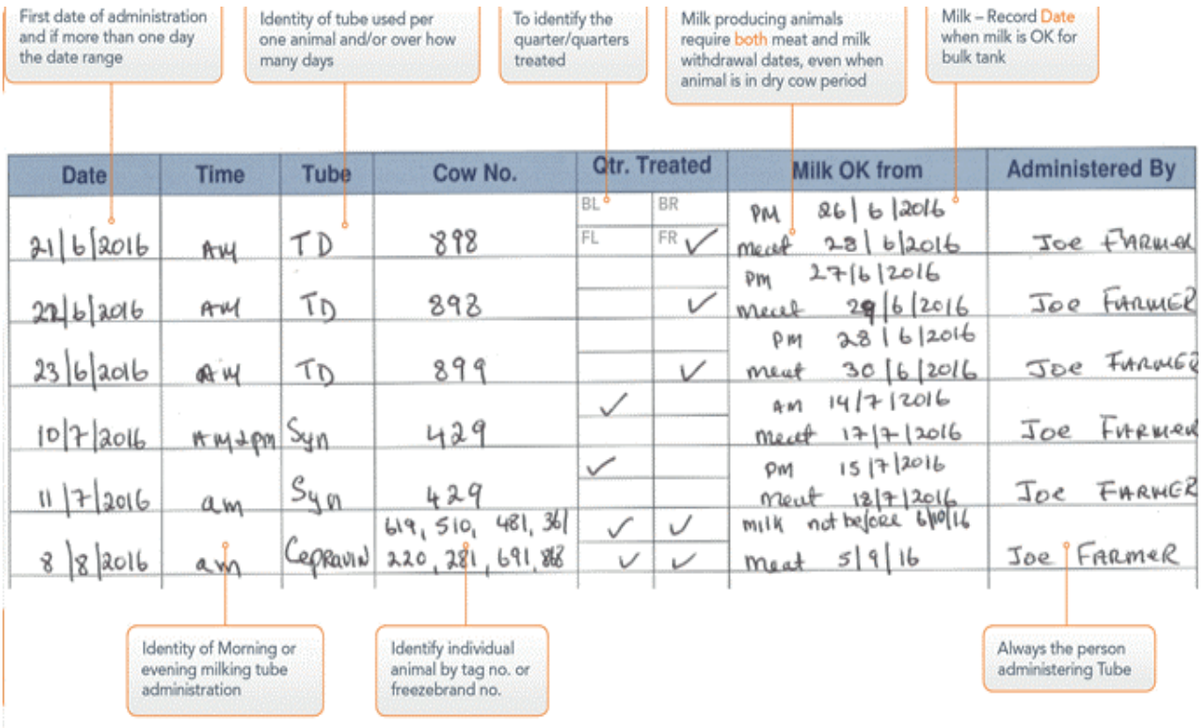


Photo 10: An illustration of health management strategies to prevent diseases on a farm

Record keeping in cattle production

Farm records are written pieces of information about activities carried out on a farm. Records are important in cattle production in many ways including determining quantities for feeding of animals, decision making, designing of a breeding programme and evaluation of individual animal or enterprise performance. Records kept on a cattle farm include Production records, Breeding records, Health record and Sales record. It is important to capture all data on a daily basis on a farm and to avoid duplication of captured information.



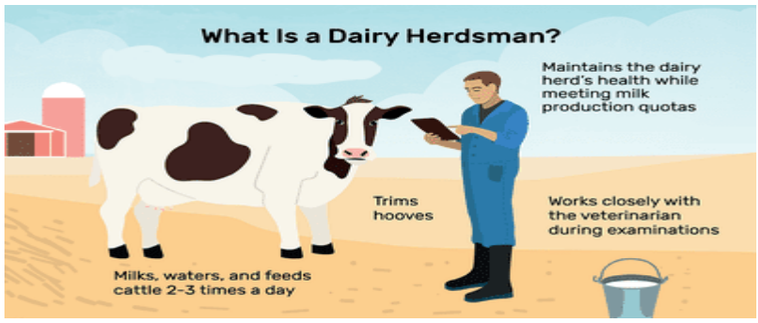
Date	Time	Tube	Cow No.	Qtr. Treated		Milk OK from	Administered By
				BL	BR	PM 26|6|2016	
21|6|2016	AM	TD	898	FL	FR ✓	Meat 28|6|2016	Joe FARMER
22|6|2016	AM	TD	898		✓	PM 27|6|2016 Meat 29|6|2016	Joe FARMER
23|6|2016	AM	TD	899		✓	PM 28|6|2016 Meat 30|6|2016	Joe FARMER
10|7|2016	AM+PM	Syn	429	✓		AM 14|7|2016 Meat 17|7|2016	Joe FARMER
11|7|2016	am	Syn	429	✓		PM 15|7|2016 Meat 18|7|2016	Joe FARMER
8|8|2016	am	Ceprovin	619, 510, 481, 361 220, 281, 691, 888	✓	✓	Milk not before 6|8|16 Meat 5|9|16	Joe FARMER

Photo 11: Sample of a Health record

Activity: Now that you have studied about animal management practices, visit an animal farm near your home on a day of spraying their herd and undertake the following assignments. Write your findings in a note book.

Write down the method of identification used on that farm
Participate in the spraying process and advise the herdsmen on the right process of spraying. Write down the agreed on procedure in your book.

a. List at least 2 pesticides/acaricides they have ever used on the farm, include the mixing ratio used.
b. Observe an animal in good health and list the signs of good health of an animal you have observed.
c. Ask for the different records used on the farm and draw the sample formats in your revision book.
d. Lastly, visit a nearby veterinary clinic or any community veterinary officer and make a list of the common diseases they have treated in your community.
e. List the symptoms of the different diseases & the drugs used to treat them.



Parting Shot

Did you know that you can participate in the livestock sector without being a farmer? Well, farmers need a lot of support services for them to produce.

Livestock farming provides young people the opportunity to be employed in the sector and earn a decent living. Go ahead and pursue a career in veterinary medicine, animal nutrition, farm management, Information technology, agricultural engineering, Sales & marketing, Transport & Logistics, Laboratory technology, Food science, Agriculture Education, Accounting & Finance, Agribusiness and many others.

Remember, agriculture is backbone of Uganda's economy and your active contribution to the sector is of great value and will go a long way in developing the sector that has lagged behind for years regardless of all the good natural factors like fertile land and good weather that God gifted the pearl of Africa.

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