

COURSE CODE:	APH301
COURSE TITLE:	Ruminant Animal Production and Husbandry
NUMBER OF UNITS:	3 Units
COURSE DURATION:	Three hours per week

COURSE DETAILS:

Course Coordinator:	Dr. O. A. Fasae
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Other Lecturers:	Dr. O. S. Sowande, Dr. (Mrs.) O. O. Adewumi and Mr. A. O. Yusuf

COURSE CONTENT:

Cattle production, problems and prospects in Nigeria. Indigenous and exotic breeds of beef and dairy cattle. Dairy and beef production systems. Dairy and beef production enterprises. Sheep and goat production- breeds, management systems, feeding for growth, production and housing. Common diseases and control in cattle, sheep and goats. Marketing of animals and their products. Methods of ageing in animals. Common farm operations, handling and control of animals.

COURSE REQUIREMENTS:

This is a compulsory course for all 300 level students in Colleges of Animal Science and Livestock Production, Plant Science and Crop Production' and Veterinary Medicine as well as those in the Departments of Agricultural Economics and Farm Management and Agricultural Extension and Rural Development. Students are expected to participate in all the course activities and have minimum of 70% attendance to be able to write the semester examination.

READING LIST:

1. Gatenby, R.M. 1986. Sheep production in the tropics. Longman Publisher. London and New York.
2. Ranijhan, S.K. 1980. Animal nutrition in the tropics. Vikas Publishing House PVT Ltd.
3. Payne, W.J.A. 1990. An introduction to animal husbandry in the tropics. 4th edition. Blackwell Science Ltd.
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6. Hunter, A. 1996. Animal Health volume 1: General Principles. Macmillan Education Ltd. London.
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14. in relation to the ecology of West Africa. Working Paper 122. Overseas Development Institute, Portland House, Stag Place, London, SW1E 5DP
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LECTURE NOTES

INTRODUCTION

The Ruminant Animal

Ruminants are characterized by their four stomach chamber and "cud-chewing" behaviour. The cud is a food bolus that has been regurgitated. There are about 150 different ruminant species including cows, goats, deer, buffalo, bison, giraffe, moose, and elk. Ruminant species can further be classified as grazers, browsers, or intermediates. Grazers, such as sheep, cattle, and buffalo consume mostly lower quality grasses while browsers such as moose and mule deer stay in the woods and eat highly nutritious twigs and shrubs. Intermediates, such as goats and white-tailed deer have nutritional requirements midway between grazers and browsers.

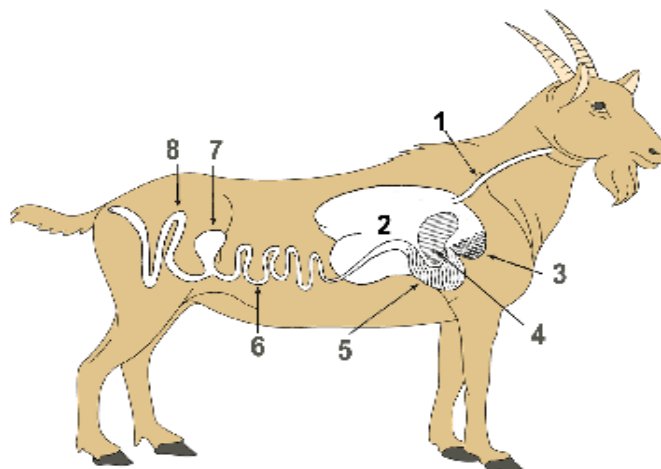
The primary difference between ruminants and simple-stomached animals, like dogs or pigs, is the presence of a four-compartment stomach that includes the rumen, reticulum, omasum, and abomasum. Llamas and alpacas are "pseudo-ruminants" because they have a three-compartment stomach instead of four like ruminants. Horses are also not ruminants; however they have a "caecum" that performs a similar function as the cow or sheep's rumen.

The Ruminant Digestive System

Mature sheep are ruminant animals. Their digestive tracts, which are similar to those of cattle and deer, consist of the mouth, esophagus, four stomach compartments, small intestine, and large intestine.

The digestive tract of goats.

1. Oesophagus
2. Rumen
3. Reticulum
4. Omasum
5. Abomasum
6. Small Intestine
7. Cecum
8. Large Intestine



The **mouth**: Like other ruminant animals, goats have no upper incisor or canine teeth. They depend on the dental pad in front of the hard palate, lower incisor teeth, lips, and tongue to take food into their mouths.

The **rumen** also called the paunch occupies a large percentage of the abdominal cavity of the ruminant animal. It is a large storage space for food that is quickly consumed, then later regurgitated, re-chewed, and re-swallowed in a process called cud-chewing. Rumination or cud-chewing occurs predominantly when the animal is resting and not eating. Microbial digestion in the rumen is the basic reason why ruminant animals effectively utilize fibrous feeds and are maintained primarily on roughages. Rumen microorganisms also convert components of the feed to useful products such as the essential amino acids, the B complex vitamins, and vitamin K. Finally, the microorganisms themselves are digested farther in the digestive tract. Healthy mature sheep will chew their cud for several hours each day. The capacity of the rumen of sheep and goats ranges from 12-24 litres depending on the type of feed.

The rumen is also a large fermentation vat. It contains billions of micro-organisms, including bacteria and protozoa, which allow ruminants to digest fibrous feeds such as grass, hay, and silage that other animals cannot efficiently utilize. Fermentation in the rumen produces enormous quantities of gas that ruminants must get rid of by belching. Anything that interferes with belching is life threatening to the ruminant and may result in a condition called "bloat." Mild cases of bloat can be treated with an antacid.

The **reticulum** also referred to as the honeycomb is closely associated with the rumen. Contents mix continually between both sections. It looks like a "honey comb. This compartment is located just below the entrance of the esophagus into the stomach. The reticulum is part of the rumen separated only by an overflow connection, the rumino-reticular fold. The capacity of the reticulum ranges from 1-2 litres.

The **omasum** also called many-piles consists of many folds or layers of tissue that grind up feed ingesta and remove some of the water from the feed. The capacity of the omasum of goats is approximately 1 litre.

The **abomasum** is the "true stomach" of the ruminant. It is similar in function to the stomach of a non-ruminant: secretion of enzymes and acids to breakdown nutrients before they enter the small intestine. The capacity of the abomasum of goats and sheep is approximately 4 litres.

As partially digested feed enters the **small intestine**, enzymes produced and secreted by the pancreas and small intestinal mucosa further breakdown feed nutrients into simple compounds that are absorbed

into the bloodstream. Undigested feed and unabsorbed nutrients leaving the small intestine pass into the large intestine.

The functions of the **large intestine** include absorption of water and further digestion of feed materials by the microorganisms present in this area. The 100-foot-long intestinal canal of sheep has a capacity to hold 12 litres.

When a goat lamb is born, the rumen is small and the abomasum is the largest of the four stomach compartments. The rumen of a goat kid represents about 30 percent of the total stomach area, while the abomasum represents about 70 percent. Hence, digestion in the lamb is like that of a monogastric animal. In the suckling lamb, closure of the esophageal groove ensures that milk is channeled directly to the abomasum, instead of entering the rumen, reticulum, and omasum. When the suckling goat kid starts to eat vegetation (first or second week of life), the rumen, reticulum, and omasum gradually develop in size and function. The lamb's rumen and reticulum are usually functional by the time it is 50 to 60 days old.

SHEEP PRODUCTION



Sheep and goats are tied for second and third animals to be domesticated after dogs. Sheep were totally domesticated. The sheep of today has evolved through thousands of generations of human contact.

The average life expectancy of sheep is about 10 to 12 years. However, the length of a sheep's productive life tends to be much less. This is because a ewe's productivity usually peaks between 3 and 6 years of age and usually begins to decline after age 7. As a result, most ewes are removed from the flock before they are 10 years old. It is possible for ewes to be productive for a period of 10 years, if they are well fed and managed, and stay healthy.

The approximate age of sheep can be determined by the teeth. At birth, lambs have eight milk teeth, or temporary incisors, arranged in four pairs on the lower jaw. The central pair of temporary incisor teeth

is shed and replaced by the permanent teeth at approximately 1 year of age. At 2 years, the second pair of milk teeth is replaced by a pair of permanent incisors. At 3 and 4 years, the third and fourth pairs of permanent teeth appear. At 4 years of age the sheep has a "full mouth." When a ewe loses some of her incisor teeth, she is called a "broken mouth." When she loses all of her teeth she is called a "gummer."

Sheep Breeds

There are more breeds of sheep than breeds of any other livestock species. Worldwide, there are more than a thousand distinct sheep breeds. Sheep come in all different shapes, sizes, and colors. They can be differentiated by their primary purpose (meat, wool, or milk), the color of their faces (black, white, red, or mottled), and/or various production or physical characteristics. The most appropriate sheep breed depends upon environmental conditions; the producers desired management intensity, and personal preference. The types are divided into four basic groups: wool, meat, dairy, and hair types.

Wool sheep: The wool breeds can withstand heat, cold, and drought, and produce satisfactorily under harsh conditions and produce fleece. e.g . Cheviot, Suffolk, Blackface, Galway.

Hair sheep: Some breeds of sheep lack wool and are covered with hair instead, like their wild ancestors. Some hair sheep have pure hair coats, whereas others have coats containing a mixture of hair and wool. Hair sheep are found mostly in Africa and the Caribbean, but are also raised in temperate climates such as the U.S. and Canada. Hair sheep comprise about 10 percent of the world sheep.

The major sheep breeds in Nigeria can be classified under the hair type of sheep. They include the Yankasa, West African Dwarf, Balami and Ouda breeds.

Meat-type: They are best adapted to farm-flock production. These breeds are commonly crossed with other commercial ewes to produce market lambs. Wool from these breeds lacks the fineness compare to the wool breed. Sheep meat is called mutton.

Dairy sheep: These are type of sheep that produce milk. They could either be hair or wool sheep.

Some foreign sheep breeds



Cheviot



Blackface



Texel



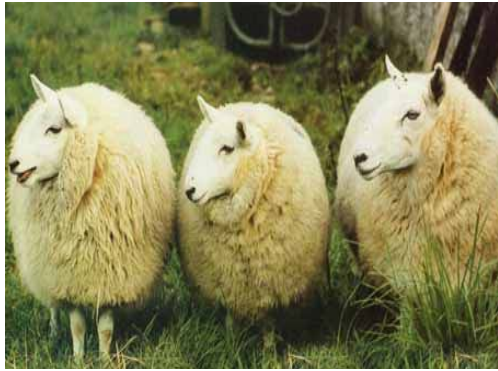
Galway



Rambouillet



Merino



Suffolk

Nigerian sheep breeds



Yankasa



West African dwarf



Ouda

Feeding of Sheep

Pastures /forages are the cheapest feed sources for both sheep and goat production. Therefore, we should use them to the fullest extent. Mostly, sheep eat grass, clover, weeds, and other pasture plants. Sheep especially love to eat "weeds." Sheep prefer plants that are young and tender and will graze close to the ground. Sheep will graze for an average of seven hours per day, mostly in the hours around dawn and in the late afternoon, near sunset. This makes them different from goats that prefer to eat browse (brushy plants) and can efficiently digest coarse, fibrous feeds. Hence, goats will consume and effectively utilize a wide variety of woody and weedy plant species found on ranges.

Sheep may not need additional feed if they are grazing on land areas with a variety of brush, weeds, and grass. Additional feed, however, may be needed in periods of drought or in dry season. The types and amounts of supplemental feed are also dictated by their productive function(s).

Newborn lambs should be allowed to suckle their dams to obtain Colostrum (first milk). Colostrum contains antibodies that protect young kids against diseases. At birth, kids are able to absorb these antibodies effectively. However, the ability to absorb colostrum antibodies decreases within the first 36 to 48 hours of life. To greatly increase the chances of survival, lambs should receive colostrum immediately after birth.

Early forage consumption will lead to early rumen development. To encourage young lambs to consume solid feed at about 2 to 3 weeks of age, fine hay can be offered. Young lamb receiving adequate amounts of milk from their dams do well on good pasture or range. If pasture or range conditions are poor, however, lambs should have access to good quality hay plus about 0.75 pounds of a grain mixture daily.

Nutrient Requirements of Sheep

Energy: Age, body size, growth, level of activity, pregnancy, lactation, and environment all affect the energy requirements of sheep. Carbohydrates and fats supply most of the energy requirements of the animal body. Much of the sheep's energy comes from the breakdown of cellulose in roughages and the breakdown of starch and fat in concentrates. Energy deficiency in sheep results in reduced growth or weight loss, reduced reproductive performance, reduced milk or fiber production, and reduced resistance to infectious diseases and internal parasites.

Protein: Protein consists of amino acids that are the basic units of all body cells. The sheep's body requires protein for growth, reproduction, milk production, disease resistance, and general maintenance. Mature sheep, like other ruminant animals, rely on rumen microorganisms to synthesize essential amino acids. Rumen microbes can utilize either nitrogen (N) of feed origin or non protein nitrogen (NPN) to synthesize amino acids and protein to meet the requirements of the host animal. Microbial protein and undigested feed protein reaching the small intestine are broken down to amino acids that are absorbed and utilized by sheep. Protein deficiencies in the diet of goats result in depleted stores in muscles, retarded fetal development, low birth weights, reduced growth, and depressed milk production.

Vitamins: Vitamins are organic compounds required in small amounts by the sheep's body. Because all the B vitamins and vitamin K are synthesized by microorganisms in the rumen and vitamin C is synthesized in body tissues, mature sheep require only dietary sources of the fat-soluble vitamins A, D, and E. During the grazing season, Sheep and goats can obtain sufficient fat-soluble vitamins from green pastures and plenty of sunlight. Goats can also store an adequate supply of these vitamins to maintain production for 3 to 4 months. Symptoms of vitamin A deficiency are associated with abnormal bone development, low resistance to infections, night blindness, and birth of abnormal lambs. Vitamin D deficiency results in bone abnormalities, such as rickets. Vitamin E, a biological antioxidant, is added to the diet of young lambs and kids to prevent nutritional muscular dystrophy. Selenium, which has a sparing effect on the vitamin E requirement, is also effective in preventing nutritional muscular dystrophy.

Minerals: Many minerals (inorganic elements) are required by the sheep. The major or macro minerals of concern are common salt (NaCl), calcium, phosphorus, magnesium, potassium, and sulfur. The trace or micro minerals of importance are cobalt, copper, molybdenum, fluorine, iodine, iron, manganese, selenium, and zinc. In sheep feeding, most minerals are usually added to mixed feeds. Some symptoms of mineral deficiencies in sheep include reduced feed intake, depressed milk production, and retarded growth and abnormal bone development in young lambs.

Water: Water is the least expensive nutrient and the largest component of live animal tissue. Environmental factors, age, growth, pregnancy, lactation, and level of activity affect the water requirements. Sheep obtain water from their feed, as well as from drinking water. Because water carries out important body functions, an adequate supply of fresh, clean water is critical to sheep during their entire life cycle.

Importance of Grazing Sheep

Ruminants can digest cellulosic substances and can convert plants to products such as milk, meat, wool, and mohair. Pastureland, therefore, is critical to the production of these ruminants and the products they provide. In order to obtain maximum profits from pasture grazing, producers must manage the land for high production per acre and must manage the animals to minimize forage waste and to ensure that they are growing sufficiently.

Grazing systems provide high-quality forage and reduce feed and veterinary costs while avoiding manure buildup. Feed costs are reduced because farmers and ranchers do not have to grow or purchase forage and grain year-round, and veterinary costs are reduced because animals on pasture have fewer health problems than those that feed in the barnyard. In addition, pastures require few or no pesticides and allow natural recycling of manure. They also provide a continuous soil cover, thus protecting wildlife habitats and important ecosystems.

Reproduction in Sheep

In their natural state, sheep are seasonal breeders; offspring are born at the time most favorable for their survival. In some domestic sheep, the breeding season has been altered both naturally and through the use of hormones. Tropical sheep breeds throughout the year.

Age of puberty: Ewes typically reach puberty at 5 to 12 months, depending on breed, nutrition, and date of birth.

Anestrous period (reproductive inactivity): This is the period when ewes normally do not demonstrate estrus (heat). Three types of anestrous are observed in ewes: seasonal (influenced by length of day), lactation (influenced by the sucking stimulus of lambs), and postpartum.

Length between estruses, or heat periods: The normal cycle for ewes is approximately 17 days between heat periods. However, it can vary from 14 to 19 days.

Duration of estrus, or heat period: The heat period usually lasts 30 to 35 hours, with a range of 20 to 42 hours. Ovulation occurs late in the period.

Gestation period: The normal gestation period of ewes is approximately 147 days, ranging from 144 to 152 days. The medium-wool breeds and meat-type breeds ordinarily have a shorter gestation period than do the fine-wool breeds. High temperatures and high nutrition levels may shorten the gestation period two or three days. Ewes bred to white-faced, wool-breed rams may have a slightly longer gestation period than those bred to black-faced, meat-type rams.

Breeding ewe lambs: Ewe lambs that breed as yearlings generally have a greater lifetime production than ewes that have their first lamb as 2 year old. Since the onset of puberty depends largely upon body weight, ewe lambs should be provided adequate levels of nutrition to reach at least two-thirds of mature weight before breeding. Also, lambs born in winter or early spring are more likely to exhibit heat the first year than are lambs born later. Ewes that lamb as yearlings should be separated from mature ewes; manage and feed them so that the yearling ewes can grow to their maximum potential size.

Ewe lambs and yearlings are normally rather shy breeders. For best results, breed them separate from older ewes. In some cases, it may be better to use rams of smaller breeds on young ewes to minimize the chance of lambing difficulties.

Nutrition has a direct bearing upon reproductive performance. Ewes kept in acceptable condition before breeding normally produce more lambs if they are flushed, or given the chance to gain weight before and during the breeding season. They can be flushed with rested pastures or by supplementation. Begin flushing three weeks before breeding and, if possible, continue through the first cycle (approximately 17 days).

Flushing ewes are most effective when they are mated early in the breeding season. Since ovulation rate is near a maximum during the middle of the season, flushing at this time is not as beneficial. The results of flushing are quite variable. Sometimes, when farm flock ewes are already on a high nutrition level before the breeding season, flushing may not affect ovulation or lambing percentage. Nutrition affects total lifetime productivity of sheep by influencing mature size. Well-developed ewes consistently have higher lamb crop percentages than smaller ewes. Fat ewes, however, are typically less fertile, do not respond to flushing, and may experience more embryonic death loss.

Ram fighting

In some countries, sheep are used for fighting. The sheep are trained to fight from a young age. They are chosen for their size. They start fighting when they are three years old. Their career lasts for about four years. Sheep fighting is usually part of a celebratory festival such as Eid al adha (the Muslim Festival of Sacrifice). In some countries, tournaments are organized, and the victorious rams are exhibited in the main roads of towns.

Sheep Production Systems

Sheep are reared by men and women with diverse working and professional background. The production systems are as numerous as the socio-economic and varied agricultural situations in the country. However, they can be broadly classified into the following:-

Tethering: This is common in many communities, where probably because of intensive cropping, it is a convenient means of rearing goats from the stand point of control, minimum labour input and utilization of feed .It is thus a sedentary system. A variation of this method is combining tethering with grazing up to 5 sheep at a time, led by ropes held by women and children.

Extensive production: This involves low carrying capacity in situations where land is marginal and is plentiful. It is characterized by low rainfall and various browse plants. The system is used by nomadic people, usually in very low rainfall areas or during winter months when crop residues are available.

Intensive production: The sheep are fed in confinement with limited access to land. It involves high labour and cash inputs. Cultivated grasses and agro-industrial by products are fed *in situ*. This system also has the advantage of allowing control over the animals.

Semi-intensive production: This system is practiced to some degree in most of the situations, but the nature and extent of integration depend on the type of crops grown and their suitability to sheep. The advantages of this system are increased fertility of land via the return of dung and urine, control of waste herbage growth, reduced fertilizer usage, easier crop management, increased crop yields, and greater economic returns.

GOAT PRODUCTION AND HUSBANDRY

Breeds of Goat in Nigeria

There are three main breeds of goats in Nigeria.

The Sahel goat

It is found more abundantly in the Sahel of the country. They have varying coat colour but usually mixed black, white and brown. They possess fine hair coat, short ears and long legs. Mature weight range from 25 – 35kg. Rams have horns. The breed is adapted to nomadic and wide range grazing. They are meat animals although they could be used for milk and skin production.

Red Sokoto or Maradi goat

The breed is found mainly in the north-western Nigeria but has spread to the savannah belt of Nigeria. It is uniformly dark red in colour and weighs 20 – 30kg at maturity. Both sexes are horned. The breed is noted for its valuable skin and it is a meat animal.

West African Dwarf (WAD) goats

They are found mainly in the forest belts of the southern Nigeria. The breed is hardy and trypanotolerant. They have small body sizes and strongly set short legs. The breed is black, brown or white or a combination of black, brown and white. They are prolific giving birth to twins and triplets. Mature weight is 20 – 25kg. The breed is used mainly for meat but also has dairy potentials.

Feeding of Goats

Feeding goat from birth to weaning

It is most important for kids to receive colostrum (the doe's first milk) during the first 24 hours of its life. A healthy newborn kid rarely needs help to suck from its dam. Colostrum, which is produced by the doe during the first 4 or so days after kidding, is thicker and darker than ordinary milk. It contains essential antibodies (immunoglobulins) that protect kids from disease, and is a concentrated source of nutrients. The newborn kid can absorb the essential antibodies in colostrum only during its first 24 hours or so of

life. These antibodies protect the kid for the first 8–10 weeks against many diseases. Excess colostrum can be stored for future use in either fermented form (3 months) or frozen form (12 months).

If the mother dies shortly after giving birth or becomes too ill to care for the kid, or if the mother refuses to accept the kids, bottle feeding of the kid is recommended. Bottle feeding requires a lot of time and a total commitment to the kid. It is best to feed the kid at the same time of day during each feeding. It is best to use a milk replacer designed specifically for goats or goat milk. Goat kids have different needs than other animals. Lamb milk replacer is too high in fat and calf milk replacer is too low in protein for goat kids. In the absence of milk replacer, you can make your own by mixing: 1 gallon of whole milk, 1 can evaporated milk, and 1 cup of buttermilk (Take the gallon of milk, pour out about 1/3 and set aside.) Pour into the gallon container 1 can evaporated milk and 1 cup buttermilk. Then pour the rest of the milk that you set aside in to the gallon container until full. Shake and serve warm. Bottles and nipples must be thoroughly cleaned before each use.

Kids eat solid food from about 1 week of age and are often seen ruminating at about 2 weeks, so it is important to give them good-quality hay and suitable concentrate from 1–2 weeks of age. Usually both hay and concentrates are provided *ad libitum*, although, particularly with concentrates, you should try to match the allowance with the kids' appetites to reduce waste. It is important to make sure that energy and protein supplements are kept fresh, so new feed material should be provided daily.

Wean kids at between 8 and 10 weeks of age, or a little older. Weaning can be abrupt, or it can be gradual with milk being withdrawn by restricting the amount fed and the number of feeds per day. Whichever weaning method is used, kids must be consuming, and have ready access to, high-quality solid food. The ration may include some high-quality roughages to assist rumen development. It is important for clean water to be available at all times.

Management of weaned kids

Weaning kids from their dams is a stress-inducing experience for both mothers and kids. Stress can cause illness and sometimes even death, so it is wise to minimize stress at all times. Intact bucklings should be weaned 8 to 12 weeks of age to avoid the possibility that they might be able to breed their dams, sisters, or other females in the herd. Doelings can stay with their dams for a longer period of time. Depending upon prevailing conditions, the weanlings may be dewormed prior to moving them to a

weaned-kids pen/pasture as far away from their dams as possible. Males and females from weaning age and up are kept in pastures separately to avoid indiscriminate breeding. When weaning kids (bucklings in particular but both sexes in general), never wean one or two kids and place them into a herd of already-weaned kids. They will be harassed to the point of exhaustion. Feed the kids after they are in their new pastures. Eating together is a familiar group activity that will distract them from harassing each other. Kids tend to wander, getting lost from the main group, therefore becoming potential targets for predators. Herding kid goats requires that one animal takes a leadership role. This can be done by introducing one or two older goats of the same sex into the herd.

Feeding goat for meat production

Feed costs typically account for about 70 percent of the total cost in a meat goat enterprise and feeding program has a large effect on profitability and herd productivity. The nutritional needs of meat goats vary according to weight, age and stage of growth and/or breeding cycle. They can be met by a variety of feedstuffs and feeding programs. There is no perfect feed or feeding program. Ration formulations are usually based upon a combination of the animals' nutritional needs, feedstuff availability and cost. The cost of feeding goats can vary tremendously according to feed formulation and source of feed ingredients.

Meat goats require water, protein, energy, minerals and vitamins in their diets. Water is by far the most important nutrient. Animals can go for a long time without food, but not without water. Energy is usually the most limiting ingredient in goat rations; protein the most expensive. Calcium and phosphorus are the two most important minerals. The ratio of calcium to phosphorus in the diet should be at least 2:1 to prevent urinary calculi, the formation of kidney stones in the bladder of male goats. Goats require vitamins A, D, E and K in their diet, but synthesize the B vitamins in their rumens.

Nutritional Requirements of Meat Goats

	Protein (CP)	Energy (TDN)
Buck	11%	60%
Dry Doe	10%	55%
Late Gestation	11%	60%

Lactating Doe	11%	60%
High Producing Doe	14%	65%
Weaned Kid	14%	68%
Yearling	12%	65%

Pasture should comprise the majority of the diets of meat goats. Goats are ruminant livestock, whose system is designed to utilize forage and other fibrous materials. When fresh forage cannot meet the nutritional needs, supplemental feeding may be necessary. Supplements should only be fed to the point where they support profitable levels of production. The amount of pasture needed to support a meat goat doe and her offspring will vary considerably, depending upon the quality of pasture and management system. Goats will do well on improved pastures, as well as brushy, woody areas. They are natural browsers and if given the opportunity will choose brush and weeds over grass.

Feeding pregnant goats (Does)

The feeding requirements for does changes based on the stage of production. Does should be fed at a maintenance level when they are dry and during the first two thirds of their pregnancy. The doe's requirements increase during the last third of pregnancy. It is critical to provide adequate nutrition to the doe to produce healthy and vigorous kids and to allow her to produce milk to raise those kids.

Early Pregnancy: During early pregnancy does can be fed to maintain their body condition unless they are thin and need to improve their body condition. Pasture or average quality hay is sufficient to meet their nutritional requirements. The does should have access to free choice mineral mixture that has been balanced for goats. This will help to ensure that the does remain healthy throughout their pregnancy. Overfeeding should be avoided. Most animals produce fat externally over their body, however, goats produce fat internally. Overfeeding can cause problems in late pregnancy for very fat does. They will not be able to eat enough to meet their energy requirements and can develop pregnancy toxemia or pregnancy disease. The body fat and the growing kids will take up so much room that nannies become too full to eat enough to meet their nutritional needs.

Late Pregnancy: During the last third of pregnancy, the doe needs to be monitored more closely. The nutritional requirements during this time increase to provide for the growth of the unborn kids. The doe's diet should be supplemented daily with concentrate in addition to the average quality hay/pasture that they have been eating. As the doe approaches the last few weeks of pregnancy, increase the quality of the hay/pasture to prepare them for lactation. After kidding, the amount of supplement can be adjusted upward. Does nursing twins or triplets will require more supplementation than does nursing a single kid.

Feeding goat for milk production

To get the best milk production from goats, excellent quality forages must be provided. A pasture that contains many kinds of plants, including browse plants, legumes and grasses is ideal. Good mixed-grass hay (cut at an early stage of maturity) is ideal for dry season feeding. Goats will eat a wide variety of plants, including weeds. They are selective eaters that will seek the most nutritious plants while grazing, browsing, or eating hay. They are also wasteful eaters, and therefore it is wise to help them use their feed more efficiently by controlling their grazing and by feeding them only a little more hay than they will require. Goats, if allowed to be very selective, they will waste more feed, but they will produce more milk. On the other hand, if you are too strict with their forage allowance, you will save money on feed but lose income from milk.

Good quality hay and a balanced concentrate is the best approach in maintaining high levels of milk production. Fiber in the total ration is needed to maintain a normal milk-fat test. However, too much poor quality fiber will lead to lowered levels of milk production. Rations containing some cottonseed hulls or other fibers may be included in the grain where hay or other roughages are not readily available. Dairy goats are good eaters and can consume from 4 to 7% of their body weight as compared to 3 to 4% consumption for dairy cows. This high level of intake allows the dairy goat to have an abundance of nutrients readily available for the synthesis of milk. Overall, the efficiency of milk production by the dairy goat is quite similar to that of the dairy cow.

Animal Identification Methods

- (1) **Ear tags:** A tag is a piece of numbered metal or plastic that is fixed by means of a hole in the ear using an applicator. Regardless of which type of tag is used, it is inevitable that some tags will be lost. It is therefore necessary that another means of identification be used in addition to ear tags. Reading of tags may be difficult unless the animal is restricted. However, ear tag is a quick and easy method of identification and also relatively inexpensive.
- (2) **Tattooing:** A tattoo is applied by making holes in the skin and forcing a marking dye into the wounds. When the wounds heal the dye is retained under the skin and leaves a permanent record of the wound. Finely ground charcoal can be used in place of special tattoo dye. It is possible to tattoo almost anywhere on the animal. Tattooing however, requires more effort for installation than ear tags and can often be very difficult to read.
- (3) **Branding:** A brand is an indelible mark that is placed on an animal. The aim of hot branding is to cause a wound, which will later form scar tissue upon which hair will not grow. The animal should be cast and restrained on the ground. Young animals are easier to restrain and branded than adult animal. The hot iron which has been heated in a wood fire to bluish-white colour is then applied to the skin. The iron is then rocked up and down and from side to side to give a uniform brand. The scar tissue formed after branding reduces the value of the skin and it is more painful to the animal.
- (4) **Flesh marks:** This is a cut or hole made in the ear or other part of an animal for owner identification. Ear notching in sheep are normally coded so that each notch in a specific ear or in a specific location on that ear has a set of value e.g. sequential numbering, letter number and individual animal number, year and month of birth. Copies of the numbering system should be made on paper so that everyone working with the sheep has access to a code card. Special tools are used for notching and can be in a variety of shapes including a "V", a crescent or a "T"-shape. Notching should be done as soon as possible after birth to minimize bleeding. The advantage of notching is that no continuing expense is required as in the case of ear tags and tattooing. However, it is slower to read than ear tags and more liable to error than tags or tattoos.

Castration

It involves the destruction of testicular function, the testicles being the two organs that lie together in the ram's scrotum. Method of castration in sheep includes:

- (1) The knife method: The scrotum is cut open and both testicles removed by knife.
- (2) Burdizzo method: The spermatic cord connecting the testicles with the rest of the body is crushed mechanically with a pair of heavy and blunt pincers thereby leading to slow degeneration and eventual complete atrophy (withering) of the two testicles in the un-opened scrotum.
- (3) Elastration method: A strong rubber ring is fitted over the lamb's scrotum and left there until the whole scrotum atrophies and falls off. The male sheep becomes a wether or wedder having lost all sexual power and desire.

Common Diseases of Goats

1. Peste des Petits Ruminants (PPR)

It is a viral disease of goat. Outbreaks are common in West Africa. PPR may be peracute (4-6 days), acute (about 10 days) or subacute (about 2 weeks). Clinical signs include catarrhal discharge from the nose, low-grade fever and intermittent diarrhea. Most animals recover. Spread of infection occurs through inhalation of discharges in the air, direct contact with sick animals, ingestion of contaminated feed and water. There is no treatment for the disease. Fluid replacement therapy combined with antibiotic and anti-diarrhea drugs may be helpful for symptomatic treatment. The only realistic approach to control is vaccination using live tissue culture rinderpest vaccine.

2. Foot Rot

It is a disease of the feet of goat caused by infection with two bacteria, *Fusobacterium necrophorum* and *Bacteroides nodosus*. Clinical signs include lameness of various degrees depending on the severity of the lesions and the number of feet affected. In worst cases, goats are reluctant to walk, tending to lie or crouch and graze in a kneeling position.

Spread of the disease occurs through contamination of the pasture. Chances of spread increases in warm weather with wet conditions. These conditions favour the survival of the organisms in the environment, cause softening of the skin of the feet and increase the chances

of infection with bacteria. Treatments involve cutting away the under-run hoof to expose the diseased tissues to the air, which improves healing. Cutting knives and shears should be disinfected with 10% solution of zinc sulphate, 5% formalin and 5% copper Sulphate or sprayed with antibiotic aerosol. The easiest but most expensive method is injection with penicillin in combination with streptomycin in high doses for sufficient drug to reach the diseased tissue. Control of the disease could be achieved by quarantine, culling of animals that do not respond to treatment and routine vaccination.

3. **Orf/Contagious Ecthyma/Sore Mouth**

It caused by a virus and is seen as scabby lesions on the lip and spread to the muzzle, nostrils, adjacent skin and round the eyes. Lesions are also found, in some cases, on udders of lactating goats resulting in mastitis. Clinical signs lead to reduced feed intake and loss of condition. Treatment is not very successful. Most cases of Orf are resolved within 4-6 weeks on their own. Isolation of infected animals and vaccination with live vaccine containing live Orf virus are the two most important methods of control.

4. **Pneumonia:**

This is used to refer to the inflammation of the lungs arising from bacterial or viral infections, mechanical factors or a combination of these. *Pasteurella multocida* or *Pasteurella haemolytica* causes enzootic pneumonia or haemorrhagic septicemia. Clinical signs are high fever, heavy breathing and death in some 90% of cases. In healthy animals *P. haemolytica* may not cause disease when present unless the animals are exposed to stress and under nutrition. Antibiotics can be used to treat infected animals and vaccination used as a means of control.

5. **Internal Parasites:**

The major internal parasites of goats are Nematodes (Roundworms) e.g. *Haemonchus spp.*, *Oesophagostomum spp* and *Trichostrongylus spp*; Cestodes (Tapeworms) e.g. *Coenurus cerebralis* and Trematodes (Flukes) *Fasciola gigantica* and *Fasciola hepatica*. The ill effects of helminth infection in goats are as follows:

- Loss of condition due to competition for nutrients.
- Diarrhea due to gastro-enteritis
- Anaemia due to blood loss
- Tissue damage from migrating larvae
- Reaction to helminth in tissues

Control of internal parasites can only be effective when goats are well managed and well nourished. Rotational grazing can effectively reduce the level of infection. Drenching with anthelmintic drugs is usually necessary whatever managerial system is practiced.

6. **External parasites:**

These parasites are usually arthropods classified as insects (flies, lice and fleas) and Acarids (ticks and mites) which parasitise the skin of goat. They cause loss of productivity in many ways including serious irritation leading to interference of feeding; skin damage and wounds predisposing the animal to secondary infections by bacteria; and acts as disease vectors. These parasites are much more serious problems in extensive and large-scale intensive units. Control of external parasites could be achieved using a combination of the following methods:

- Grazing management
- Washing and disinfection of livestock premises
- Treatment of infected animals through the application of insecticides and acaricides as sprays, dip baths, manual application, impregnation into ear tags and neck or tail bands and in pour-on or spot-on preparations and injections.
- Good hygiene on farm premises to destroy or disrupt arthropod breeding cycles.

DISEASE CONTROL

(1) **Breeding animals for the environment:**

Some diseases are peculiar to certain environment. Within the same environment some animal breeds may be resistant to the disease. Genetic selection of such animal should be an important part of integrated approach to animal health. This involves selection for disease resistance in livestock breeding programmes.

(2) **Health maintenance through surgical procedure:**

Disbudding/dehorning of young animals prevent injury in housed animals. Castration of male animals has significant implication on health as it reduces fighting in the sexually matured animals. Removal of supernumerary teat is a wise precaution as such teat is disposed to develop mastitis.

(3) **Modification of the environment:**

This may be achieved through provision of adequate nutrition and supplementary feeding of free range animals, grazing management (rotational grazing to prevent build up of infective micro-organisms and to break the life-cycles of parasitic worms), housing of animals, disinfection and general hygiene.

(4) **Immunity:**

Young animals when exposed to colostrum from the does greatly facilitate the acquisition of passive immunity because colostrum is rich in antibodies. Vaccination of animals involves the exposure of the animal to infective agent or its products in such a way that the immune system is stimulated and protection against subsequent exposure to the agent results, without the occurrence of clinical disease.

(5) **Prophylaxis:**

The measures taken in prophylaxis fall into two classes: one tends to protect the animal from the action of pathogenic organisms/agents and the other has the objective of rendering the animals able to resist them. Sanitary prophylactic measures involve subjection of individual animal to a health inspection and isolation in quarantine before being introduced into the herd. Sick animals should be isolated and kept within the area where it was when the disease was diagnosed. For certain diseases, the statutory health regulations require slaughter of sick and contaminated animals.

Chemical medical prophylaxis is used for the protection of vulnerable animals by injection of synthesized chemical products. This method is mainly used in the prophylaxis of diseases due to protozoan parasites of the digestive tract and blood system.

The products are scattered on food at intervals of time from one day to a week, or injected under the skin or muscles. Their slow diffusion allows spacing of protective injections over several months and gaining of chemoprevention over a long period.

(6) **Vector Control:**

Many major diseases of livestock in the tropics are transmitted by and develop in the arthropods, such as flies, lice, fleas, ticks and mites. The control of these vectors reduces disease transmission, loss of blood, skin irritation and damage. Vector control could be through the use of chemical agents as sprays, dip baths, injections, pour-on or spot-on.

RECORD KEEPING

Record keeping is preserving or reserving in a certain state, a formal writing of any fact or information. It applies to all classes of livestock production. Record keeping is important for the following reasons:

1. A farmer will know whether he is operating at a loss or profit.
2. He will know the nutritional status of the animals under various management regimes.
3. Through an efficient and adequate breeding record a farmer will know which male serves a female animal and be able to avoid inbreeding problems.
4. A farmer will know which disease is prevalent in his flock and plan for its control.
5. Record keeping is vital in making management decisions, and detecting and correcting management errors.
6. Through good record keeping, government can plan national livestock projects.

Types of records

A **Ancillary records:**

These records are kept in hard cover notebooks at the farm. These are

2. Mating record – record of date, method of mating, male and female mated.
3. Lambing/kidding and weaning records – record of date of birth, type of birth, sex, birth weight, mortality, weaning date and weaning weight.
4. Health record – record of history of any disease diagnosed in any animal or flock, prognosis, treatment administered, control measures taken, response of animal(s) to treatment or measures and other relevant remarks.
5. Feed and drug acquisition record – record of detail inputs acquired for farm use.
6. Sales record – record of the revenue realized from the farm operations.
7. Monthly record – record of monthly stock taking of the operations of the farm. That is, current and previous months' summaries of total and class of stock (female, male, weaned lambs/kids, mortality, lambings/kiddings, culling, sales, purchases, transfer and revenue).

B. **Core records:** These records are entered in specially designed hard books and are intended for computerization.

1. Pedigree record – contain animal tag number, flock, date of birth, sex, dam, sire, date of disposal, and reasons for disposal (coded).

2. Breeding record – contain breeding date, lambing/kidding date, parity, liter size, sex, birth weight, survival (coded), weaning weight, weaning date.
3. Live weight record – usually taken monthly but could be more frequent to follow experimental protocol. It contain information on month, tag number, date and live weight.
4. Fattening record – contain information on the date the animal enters or leave the feedlot, initial and final weight, the regular weighing date and the amount of feed offered.
5. Milking record – contain dates, tag number, daily milk yield, total milk yield and lactation length.
- 6.

PRODUCTS FROM GOATS

A list of the main products from sheep and goats is listed below.

Products from milk

- Fresh milk: only from goats.
- Ultra High Temperature (UHT) processed milk: only from goats.
- Fresh cheese (from raw or pasteurized milk): sheep and goats.
- Seasoned cheese (from raw or pasteurized milk): sheep and goats

Products from meat

- Meat from sheep and goats of different ages for consumption in different seasons.
- Meat from adult animal can be made into some traditional dishes in certain regions.
- The adults meat can be transformed (e.g. goat ham).



CATTLE PRODUCTION

Cattle Production, Problems and Prospects in Nigeria

An average Nigeria consumes only 3.245g of animal protein of animal protein per day. Cattle industry has been making significant contribution to the National Economy of the country in that it provides. Food such as meat, milk and egg, employment, raw materials for industries like hides and skin for clothing, shoes, as source of foreign exchange, generates income to rural people through sales of animals and their products

Prospects

Nigeria has high prospects of increasing her cattle population because of increased preference for beef, good prices brought about by population growth, better health and nutritional education of the citizens, high economic growth rate, better per capita income all leading to higher demand for beef, per capita consumption of animal protein is grossly inadequate hence market favours producers. Cattle breeds are adapted to the environment. Vast grasslands are available in the country for cattle production. There are large rivers and lakes for adequate water supply. Animal traction and transport are available in Northern Nigeria. Building requirements for cattle production is not elaborate, hence low initial capital outlay. Beef animal serves as financial security or collateral in times of need. No tribal, religion or social inhibition or taboo to beef consumption or leather goods. Availability of personnel to man the animals

Problems

1. Socio-cultural

Cattle production is the traditional occupation of the Fulanis and Shuwas in Nigeria. They are characterized by the love of animals, dependence on daily milk economy, an annual transhumant system of production forced on them by the agro-climatic constraints, and hence a constant base shifting that makes it difficult to impart new knowledge and technical innovations. Overstocking often leads to overgrazing of available grasslands. Unfavourable land tenure system is a major socio-cultural constraint

2. Management

Management includes nutrition, breed and breeding, housing, disease control, herd health management, environmental factors. To get more beef, we need to improve the environmental factors directly affecting production. Emphasis was placed in the past on developing a high genetic potential cattle for production by introduction of exotic breed. The nation can do better in cattle industry development based on the existing highly adapted breeds. Biological efficiency however, without regard for environment which was to support it is undesirable and often leads to failure. Nutrition is the most important single factor, apart from endemic disease, constraining livestock production in Nigeria. Wide seasonal variations have an important influence on food production. Irregular precipitation coupled with high rates of evaporation brings about two seasons. When there is high variability in feed supplies, marked fluctuations arise in the weight gain of grazing animals causing poor quality meat. Improvement in pasture is very expensive. Land gradient in some cases does not lend itself to mechanization. Thus, there is need for concentrate supplementation. Lack of improvement in crop yields and the competition between human and animals as well as brewing industries for the available grains makes meeting nutritional requirement at reasonable cost more difficult to achieve. The beef industry is also faced with insidious economic disease which leads to breeding inefficiency, reduced weight gain, decreased feed efficiency, poor condition and even death.

3. Financial constraint

Beef cattle industry suffers untold hardship despite government effort on lending policies to assist livestock farmers through injection of money from financial institutions. However, the slow rate of production, returns and recovery of loans, lack of technical know-how on processing loans and lack of security guarantee are parts of the problems leading to low financing of cattle industry up to the present time.

4. Marketing

There is no organized market system, no market information, no standard or organized auction of live cattle, exploitative middlemen, inefficient transportation, slaughtering and processing

5. Lack of commitment

There is generally lack of personal commitment on government farms. No motivation, no sense of patriotism on government farms, high ranking officers are not personally involved,

overstaffing is the order of the day. Official protocols kill initiatives. These make government farms an unprofitable venture.

Indigenous and Exotic Breeds of Beef and Dairy Cattle

Family BOVIDAE- Taurine

- Bibovine
- Bibontine
- Bubaline

Taurine- Bos Taurus

- Bos Indicus

Bibovine – Bos gaurus

- Bos Frontalis

Bibontine-Bos gunniens

- Bos bison

Bubaline- buffalo found mainly in South East Asia and Phillipines

Types of cattle

1. Beef type-mainly for meat e.g Sokoto Gudali, Red Bororo, Ndama (Borgu), Brown Swiss (have great width and depth of body)
2. Dairy type- mainly for milk White Fulani, Kuri, Shuwa Arab (Wadara), Holstein, Jersey, Ayrshire (lean angular with well developed mammary gland)
3. Dual purpose type: meat and milk production e.g Muturu, Shuwa (Wadara), Azuwal, Biu
4. Draft type: work animal (great size, ruggedness long legs for walking long distance) e.g Sokoto Gudali

Classes of cattle

1. Humped or zebu (highly resistant to rinderpest and better adapted to living in arid or semi-arid areas)
 - a. Long horned e.g White Fulani or Bunaji and Red Fulani or Rahaji
 - b. Short horned e.g. Sokoto Gudali, Shuwa Arab or Wadara

2. Humpless or Non-zebu (resistance to trypanosomiasis, survive in forest areas)
 - a. Long horned cattle e.g. Ndama, Kuri or Budama
 - b. Short horned cattle e.g. Muturu

Breeds of Indigenous Cattle

Kuri

Also known by: *Kouri, Baharié, Buduma, Budduma, Budumu, Boudouma, Chad, Dongolé, Kuburi, White Lake Chad*

The gigantic bulbous horns are an unmistakable trait of the Kuri. These cattle are native to the shores of Lake Chad where Cameroon, Chad, Niger and Nigeria join. The Kuri are believed to be descended from the Hamitic Longhorn cattle and have been herded by the Buduma and Kuri peoples for centuries.



Kuri Cattle

The tribesmen were strict in their selection of animals for their horns, many of which grow in a lyre or crescent shape. The horns sometimes reach 130 cm in length and 55 cm in diameter. Most remarkable is the unique pear shape of the horns.

These animals are kept as dairy cattle in herds of approximately 30 females with one bull. The animals spend several hours each day in the water swimming in search of water plants for food. It is thought that the horns act as floats. The cattle are acclimated to water to such a degree that they survive with difficulty away from their indigenous area. They are easily affected by the sun if unable to bathe. Because of this, the Kuri are largely unsuitable as working animals. The bulls, which are docile and

friendly in temperament, are occasionally used as pack animals but they are slow and tire easily. The females yield 4 liters of milk a day after nursing their calves.

The Kuri are tall for an African breed, with a long back, shallow body and a large, bony rump. The legs are strong, long and bony with large, widely cleft hooves. Kuri are usually white in color. The females are 135 to 145 cm in height and average 400 kg in weight. The bulls range from 152 to 180 cm and average 475 kg of weight. Some males will reach 600 kg.

Red Fulani

Also referred to as M'Bororo, Red Bororo, Wodabe, Fellata, Abori, Bodadi, Brahaza. They are found in Borno and Sokoto states and Chad Republic. Plain red coat coloured, temperament can be nervous and intractable. Adult live weight is 350 – 450kg and possesses long (up to 140cm) lyre-shaped horns. They are poor milkers.

N'Dama

Other Names: *Boenca* or *Boyenca* (Guinea-Bissau), *Fouta Jallon*, *Fouta Longhorn*, *Fouta Malinke*, *Futa Malinke*, *Mandingo* (Liberia), *N'Dama Petite* (Senegal). Incorrect names that are sometimes used: *Dama* and *Ndama*.



provided by Campagnie J. Van Lancker

The N'Dama breed is the most representative "Bos Taurus" breeds in West Africa. The origin of this breed is located in the Fouta-Djallon highlands of Guinea (Conakry). From there the N'Dama has spread to the sudanian and guinean regions. Being trypanotolerant, it has been used for large scale dissemination for grazing savannah in Congo, Central Africa, Gabon, Nigeria and Zaire, especially in the regions infested by the tse-tse fly. The N'Dama is a hardy breed, medium size type (100 cm at shoulder height for cows; 120 cm for bulls) with a large and strong head and with lyre-shaped horns. Its skin, with short and thin hair, is fawn colored but varies from sand to black colour and sometimes spotted.

Cows produce only 2 to 3 liters milk per day during 7 to 8 months. The N'Dama breed is used for meat and the ratio carcass/live weight is around 50%. The meat has a very good flavour without much fat. Average live weight for a mature steer varies between 250 to 300 kg. In West Africa, to date there are approximately 7 million head of N'Dama. For the last 65 years, this breed has been developed in Zaire, where large scale herds have been improved by permanent selection practices by a private company named "Compagnie J. VAN LANCKEIC" which owns over 40,000 head of purebred N'Dama. This company has managed to increase, by selection, the average live weight by 30 to 50kg without reducing the breed hardiness. This company is collaborating with the International Livestock Research Institute (ILRI) for an improved genetic analysis and selection.

Bunaji

Bunaji or White Fulani cattle is a white, black-eared and medium-horned breed, and is the most numerous and widespread of all Nigerian cattle breeds. The NNLRS estimated that they represent some 37% of the national herd. They are found from Lagos to Sokoto, Katsina and Kano States and spread across the Nigerian Middle Belt. The only areas from which they are significantly absent are old Borno state (Adamawa and Yobe States), where Rahaji and Wadara predominate, and in the south-east, where there are no resident zebu. The movement into the derived savannah and to the edge of the humid zone has largely been of Bunaji and pastoralists generally agree that they are superior to all other breeds of zebu in resisting disease.

Gudali

There are two quite distinct types of Gudali in Nigeria – the Sokoto Gudali (or Bokooloji) and the Adamawa Gudali.

Sokoto Gudali

There are two quite distinct types of Gudali in Nigeria – the Sokoto Gudali (or Bokolooji) and the Adamawa Gudali. The Sokoto Gudali is a uniform cream, light grey or dun, the dewlap and skin folds are highly developed and the horns almost absent. Although the Sokoto Gudali stereotypically occurs mainly in the northwest of Nigeria, in reality it is now distributed widely throughout the country. The NNLS estimated that they represent some 32% of the national herd.

Adamawa Gudali

The Adamawa Gudali resembles the Bunaji in conformation. It is medium to large sized, with medium-length horns, and usually pied, or with a white, black, red or brown coat. It has thick, crescent-shaped horns, a pendulous hump, and a short head and muzzle. The pendulous hump is the feature that most reliably distinguishes it from the Bunaji. The NNLS estimated that Adamawa Gudali represent some 2% of the national herd. The Adamawa Gudali, as its name implies, is restricted to Adamawa. Both Kanuri and Fulbe (Fulani) pastoralists own Adamawa Gudali cattle. It is rare for them to have complete herds of Adamawa Gudali, and often they are mixed with Wadara, Bunaji or Rahaji. They are regarded by many farmers as the indigenous race of the region and are common in villages. Adamawa Gudali are favoured for ploughing, but when they become too large to pull a plough effectively they are further fattened in the compound and sent to market.

Azawak

The Azawak is said to be native to the Azawak Valley north-east of Nigeria and is distributed along its north-western border. It is lightly built with medium-length horns. Although Azawak in Niger are commonly described as red, the Azawak that enter Nigeria are usually a light fawn colour, though they can also be white, brown, pied and black. The NNLS estimated that they represent just 0.7% of the national herd. A small population of Azawak cattle exists in Nigeria throughout the year, but majorly as seasonal transhumants. Azawak are generally only found on the border north and west of Sokoto but there were also some in the north-west of Borgu and dotted along the frontier from Sokoto to Katsina.

Rahaji

The Rahaji is one of the largest zebu breeds and is distinguished by its deep burgundy-coloured coat, pendulous ears and long, thick horns. It is the third most numerous breed of cattle in Nigeria, some 22% of the national herd. The Rahaji is adapted to arid and semi-arid regions and rarely goes further south than Kaduna in the wet season, except for the isolated population on the Mambila Plateau in the south-east. Fulani pastoralists consider the Rahaji an extremely prestigious breed and many herds of 'white'

cattle include a few Rahaji for crossbreeding. Nonetheless, it tolerates neither humidity-related diseases nor poor nutrition.

Wadara

Wadara cattle are medium-sized, lightly built cattle, and are usually dark red, black, pied or brown. They are short-horned and have a small erect hump, representing some 6.6% of the national herd. Wadara cattle are the 'indigenous' cattle of Borno and are referred to by the Koyam and related pastoralists as 'our' cattle. They are frequently called 'Shuwa' in the literature, after the Shuwa Arabs who also herd them. A related breed with a white coat, the Ambala, is often traded into Nigeria from Chad.

West African Dwarf Shorthorn

The West African dwarf shorthorn or muturu is small bodied, and blocky in conformation with short, fine-boned limbs. It has a compact body, no hump, a straight back, and a broad head. The face is slightly dished, and the horns are very short. In south-central Nigeria, the muturu is generally black, or black and white. Animals on the Jos Plateau itself are usually black and white but are distinctly larger than lowland animals. There are more variations in the northern populations; brown, red or tawny animals were recorded.

Within Nigeria, Muturu cattle have a very disjoint distribution suggesting the gradual retreat of a once more widespread population. Muturu are widely dispersed and often stall-fed, and so are less visible than zebu. There are isolated populations of Muturu along the Republic of Cameroon frontier up as far as south-eastern Borno, adjoining the Michika-Mubi area of Adamawa. Small clusters exist in the Atlantika mountains, south-east of Yola and near Cham east of Bauchi. Muturu are still relatively common south-east of the Jos Plateau in the dry savannah. There is another nucleus of Muturu north of Tgina in the north-west, with diverse coat-colours suggesting a link with the north-eastern populations. Muturu were probably once kept throughout the whole of southern Nigeria and that their disappearance from many areas is relatively recent. At present, the major concentrations of Muturu are in the south-east, in the Cross River area and among the Tiv people in and around Makurdi. Muturu are kept throughout the Igbo areas but in very low densities. The division of muturu into different populations is somewhat controversial. The research defined four subsets; northern savannah/montane, plateau, derived savannah and forest. Only the first group is distinctive in physical appearance; the further north they are found, the larger in stature they are. Muturu in the derived savannah and forest

are similar in colour, conformation and management and contrast with those in the northern savannah/montane environments.

Keteku (taurine x zebu crosses)

These are crosses of Muturu x Zebu or Muturu x N'Dama. The Muturu x Zebu cross is called the Borgu Keteku and the Muturu x N'Dama, the Lagos Keteku. Keteku are significantly less common than previously thought and their distribution quite different. It is unlikely that there as many as 100,000 of all types. Borgu Keteku combines Muturu and Bunaji features with white, grey and black types predominating, and more occasionally red and brown. The horns are long compared with a muturu, but the hump smaller, and the legs shorter than a Bunaji. In Nigeria, keteku in herds are restricted to a narrow band along the Benin Republic border in the region usually known as 'Borgu'. Further east, keteku are occasionally kept adjacent to villages in northern Yorubaland.

Exotic Breeds of Cattle

Ayrshire cattle

The Ayrshire breed of dairy cattle originated from Ayrshire in Scotland. The average mature Ayrshire cow weighs 1000 - 1300 pounds (450-600 kg). Ayrshires have red markings. The red can be an orange to a dark brown, with or without colored legs. They are known for low somatic cell counts, ability to convert grass into milk efficiently, and hardiness. The breed's strong points are the now desired traits of easy calving and longevity. They also have a very "spirited" nature, which may or may not be desirable.



Ayrshire Cow

The breed was also known as Dunlop cattle (see Dunlop) or Cunninghame cattle (see Cunninghame). They were exported to all parts of the world and extensive cattle docks used to exist at Cunninghamhead station for loading and export purposes. The Dunlops of that ilk are credited with breeding this line, with animals being brought in from Holland. Ayrshires are medium-sized cattle weighing over 1200 pounds at maturity. They are strong, rugged cattle that adapt to all management systems including group handling on dairy farms with free stalls and milking parlors. Ayrshires excel in udder conformation and are not subject to excessive foot and leg problems. These traits make Ayrshires outstanding commercial dairy cattle. Other traits that make Ayrshires attractive to the commercial dairyman include the vigor of Ayrshire calves. They are strong and easy to raise. The Ayrshire is a moderate butterfat breed and relatively high protein breed. The actual average of all Ayrshires on official ABA programs in 2002 is 17,230 pounds of milk with 665 pounds of fat and 542 pounds of protein. Ayrshires (especially the ones from Finland) are also crossbred with Holstein cattle in order to improve the Holstein's hardiness and fertility.

Guernsey cattle

The Guernsey is a breed of cattle used in dairy farming. It is fawn and white in colour, and is particularly renowned for the rich flavour of its milk, as well as its hardiness and docile disposition. The unique qualities of the milk produced by the Guernsey cow have made the breed world famous. The milk has a golden colour due to an exceptionally high content of beta carotene. Beta-carotene is a source of Vitamin A, which has been touted to help reduce the risks of certain cancers. The milk also has a high butterfat content of 5% and a high protein content of 3.7%.^[2] Guernsey cows produce around 6000 litres per cow per annum. In the US Guernsey cows average 16,200 pounds of milk per year with 4.5% fat and 3.2% protein. Guernsey cattle are known to produce the highest percentage of A2 milk of all breeds of dairy cattle.



Herd of Guernsey Cattle

As its name implies, the Guernsey was bred on the British Channel Island of Guernsey. It is believed to be descended from two breeds brought over from nearby France, Isigny cattle from Normandy and the Froment du Léon from Brittany. Today the breed is well-established in Great Britain, the United States, Canada, South Africa and elsewhere.

The cow weighs 450 to 500 kg, slightly more than the average weight of the Jersey cow which is around 450 kg (1000 pounds). The bull weighs 600 to 700 kg which is small by standards of domestic cattle, and they can be surprisingly aggressive. The Guernsey cow has many notable advantages for the dairy farmer over other breeds. These include high efficiency of milk production, low incidence of calving difficulty and longevity. However, inbreeding is becoming a concern due to the small gene pool in a given area, and may be solved in most cases by exchanging cows with no overlap in lineage from other farms. Guernsey cows are also sometimes regarded as somewhat more fragile than comparably sized breeds.

Jersey cattle

Jersey cattle are a small breed of dairy cattle. Originally bred in the Channel Island of Jersey, the breed is popular for the high butterfat content of its milk and the lower maintenance costs incurred by its lower bodyweight, as well as its genial disposition. The Jersey cow is quite small, ranging from only 360 to 540 kg (800 to 1200 pounds). The main factor contributing to the popularity of the breed has been their greater economy of production, due to: The ability to carry a larger number of effective milking cows per unit area due to lower body weight, hence lower maintenance requirements, and superior grazing ability. Ease of calving and a relatively lower rate of dystocia led to their popularity in crossbreeding

with other dairy and even beef breeds to reduce calving related injuries. They have high fertility, high butterfat conditions, 6% butterfat and 4% protein, and the ability to thrive on locally produced food. Bulls are also small, ranging from 540 to 820 kg (1200 to 1800 pounds), and are notoriously aggressive. Castrated males can be trained into fine oxen which, due to their small size and gentle nature make them popular with young teamsters. Jerseys come in all shades of brown, from light tan to almost black. They are frequently fawn in color. All purebred Jerseys have a lighter band around their muzzle, a dark switch (long hair on the end of the tail), and black hooves, although in recent years color regulations have been relaxed to allow a broadening of the gene pool.

They are calm and docile animals, but tend to be a bit more nervous than other dairy cow breeds. They are also highly recommended cows for first time owners and marginal pasture. Unfortunately, they have a greater tendency towards postparturient hypocalcaemia (or "milk fever") in dams and frail calves that require more attentive management in cold weather than other dairy breeds due to their smaller body mass and greater surface area.



Jersey cattle being judged at a show in Jersey, home of the breed

As its name implies, the Jersey was bred on the British Channel Island of Jersey. It apparently descended from cattle stock brought over from the nearby Norman mainland, and was first recorded as a separate breed around 1700.

Charolais cattle

Charolais cattle are a beef breed of cattle (*Bos taurus*) which originated in Charolais, around Charolles, in France. They are raised for their meat and are known for their composite qualities when crossed with other breeds, most notably Angus and Hereford cattle. The breed tends to be large muscled, with bulls weighing up to 2,500 pounds (1,100 kilograms) and cows up to 2,000 pounds.



Charolais Bull



Charolais cow and calf

The breed was introduced in the southern US as early as the 1940s. It was the first popular breed after the English breeds and Brahmans. It was known to produce beef animals that had more red meat and less fat. The breed was often crossed with English breeds. Despite their relatively northerly origin, Charolais tolerate heat well, and show good weight gains on even mediocre pasturage. The coat is almost pure white. The Australian and Canadian breed standards also recognise cattle possessing a light red colour called 'Red Factor' Charolais. The term *Charbray* refers to the offspring of Charolais crossed with Brahms and is recognised as a breed in its own right. Charolais also can be black in colour.

Angus cattle

Angus cattle (Aberdeen Angus) are a Scottish breed of cattle much used in beef production. They were developed from cattle native to the counties of Aberdeenshire and Angus in Scotland, and are known as Aberdeen Angus in most parts of the world.



Mixed herd of Black and Red Angus



Angus cattle grazing

They are naturally polled (do not have horns) and solid black or red, although the udder may be white. There have always been both red and black individuals in the population, and in the USA they are regarded as two separate breeds - Red Angus and Black Angus. Black Angus is the most popular beef breed of cattle in the United States, with 324,266 animals registered in 2005.

Red Angus cattle occur as the result of a recessive gene. Breeders collecting red cattle from black herds began the Red Angus Association of America in 1954. Other countries such as the United Kingdom and Canada still register both colors in the same herd book. The Angus breed is known to be prone to several possible genetic disorders. Angus cattle are widely used in crossbreeding to reduce the likelihood of dystocia (difficult calving). They are also used as a genetic dehorner as the polled gene is passed on as a dominant trait.

Beefmaster

Beefmaster cattle have been developed by Lasater combining the breeding of the Brahman and Hereford cattle and also used some registered Shorthorn bulls. After making crosses of Brahman-Hereford and Brahman-Shorthorn, he felt a superior animal had been produced and called the cattle

"Beefmaster." The exact pedigree of the foundation cattle was not known. The breeding operations were carried on in multiple-sire herds and rigid culling was practiced.



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The cattle were handled under range conditions that were often adverse, and a culling program was started based on disposition, fertility, weight, conformation, hardiness and milk production. Stress was placed on the production of beef. No selection has been made to characteristics that do not affect the carcass, such as horns, hide or color. The original concepts of Tom Lasater in developing Beefmaster cattle have continued. Selection continues for those points which were originally used and are now known as the Six Essentials - Weight, Conformation, Milking Ability, Fertility, Hardiness and Disposition. Considerable progress has been made in selecting cattle that give very satisfactory levels of production under the practical and often severe range conditions. Satisfaction by ranchers and creditable performance in feedlots indicate the value of stressing the important utilitarian points in developing breeding herds.

Brahman cattle

The Brahman or Brahma is a breed of Zebu cattle (*Bos primigenius indicus*), later exported from India to the rest of the world. The main breeds used were Kankrej, Guzerat, Nelore or Ongole and the Gir or Gyr cattle. It is named for the sacred cow of Hinduism.



Brahman bull



Brahman Calves

The American Brahman has a distinct large hump over the top of the shoulder and neck, and a loose flap of skin (dewlap) hanging from the neck. Their ears are larger than *Bos taurus* breeds. Bulls weigh 1,600 to 2,200 pounds (800 to 1,100 kg) and cows weigh 1,000 to 1,400 pounds (500 to 700 kg). At birth, calves weigh 60 to 65 pounds (30 to 33 kg). American Brahman are known as a docile, intelligent breed of beef cattle. Brahman cattle can be gray or red color. Their tail switch is black, and they have black pigmentation on their noses, tips of ears, and hooves. They are primarily a horned breed of cattle however there are some bloodlines of Brahman that are naturally polled (without horns).

Brahmans have a greater ability to withstand heat than European cattle. They have more sweat glands, and also an oily skin, thought to help repel pest insects along with a smooth coat. They have a short hair coat. They are also more resistant to parasites and disease. Brahman have also been extensively crossbred with European cattle in subtropical United States, in Central America and in some tropical areas of the world to gain their advantages in hot climates. A Brahman cow is an extremely good mother, offering protection and an abundance of milk for her calves. Brahman calves tend to measure high weights at weaning because of the outstanding milk given by Brahman cows. In some countries, especially in South America, Brahman cattle are used for both milk and beef production.

The Brahman is mainly used for breeding and the meat industry; it has been crossbred extensively with *Bos taurus* (European) beef breeds of cattle. Brahman cattle are known for their extreme tolerance to heat conditions, and therefore are used in many tropical regions. They are also resistant to insects due to their thick layer of skin. Brahman cattle live longer than many other breeds, often still producing calves at ages 15 and older.

Cattle Production Systems

Livestock production systems may be classified according to a number of criteria, the main ones being integration with crop production, the animal-land relationship, intensity of production, and type of product. Other criteria include size and value of livestock holdings, distance and duration of animal movement, types and breeds of animals kept, market integration of the livestock enterprise, economic specialization, household dependence on livestock and farming systems approach. A farming system is defined as a group of farms with a similar structure, such that individual farms are likely to share similar production functions. A farm is usually the unit making decisions on the allocation of resources.

Pastoral and agropastoral systems

Pastoral systems are associated with zones that are too dry for cropping to provide a basis for subsistence and are defined as land-based systems occurring in areas with a length of growing period (LGP) of less than 180 days, where the grazing of ruminants is the predominant form of land use. Based on the degree of economic dependency on livestock, a pastoral production system has been defined as one in which 50 percent or more of household gross revenue (the total value of marketed production plus the estimated value of subsistence production) comes from livestock or livestock-related activities, or where more than 20 percent of household food energy is directly derived from livestock or livestock-related activities. Three types of pastoral system can be identified. In the rainfall range of less than 400 mm per year:

- nomadic pastoralism, which is a pure pastoral system, characterized by little or no agriculture and by high mobility of people and animals in search of grazing and water;
- transhumant pastoralism, which is based on more or less regular seasonal migrations from a permanent homestead. It is characterized by almost exclusive reliance on animals and animal-related activities for household revenue. There is no cultivation and there is little use of crop residues by animals. The basic production units are independent nuclear families or groups

joined together in camps, whose composition varies seasonally and whose members cooperate to varying degrees in economic activities. The animals are grazed on communal pastures using family or hired labour.

In areas with annual rainfall between 400 and 600 mm:

- agropastoralism, in which livestock production is associated with dryland or rainfed cropping and animals range over short distances. This system is characterized by a high degree of reliance on pastoral activities for household revenue, but rainfed cultivation by, or on behalf of, the household also contributes an important share (up to 50 percent).

The main functions of livestock production in pastoral households are to provide subsistence products (milk, blood and meat), to meet social obligations (bride price, stock alliances and stock patronages) and to insure against disaster (drought, epidemics, raids).

Livestock management in pastoral systems is characterized by three principles; adaptation to the environment in the attempt to ensure subsistence, risk averting strategies and adaptation to the institutional environment (characterized by communal grazing systems).

Mixed systems

Semi-arid, subhumid and humid zones:

The term mixed systems has a dual meaning: the farming system is based on livestock but practiced in proximity to other farming systems based on cropping (e.g. pastoral systems in arable areas) and livestock subsystems of integrated crop-livestock farming. The first type is more common and is characterized by seasonal penetration into the more humid areas, with southward movements during the dry season and northward movements during the rainy season. Integrated crop-livestock farming is categorized based on agro-climatic conditions in particular rainfall and cropping pattern, pressure of human population expressed by cultivation intensity, tsetse challenge and overall importance of livestock expressed by livestock densities and species.

A major characteristic of mixed farming systems is the varying degree of interaction between crops and livestock. Mixed systems have also been defined as those which derive between 10 and 50 percent of gross revenue from livestock, or 50 percent or more from cropping. The basic principle of these systems is that rainfed agriculture is the main source of income, although livestock provide an important additional source.

Livestock management is usually sedentary and if movement is part of the management system, it is generally restricted to short distances. Cattle are normally grazed on communal pastures, herded by family or hired labour and kraaled at night in order to prevent theft or crop losses. Manure is often collected and calves are separated from their dams to make milking possible. In some areas, cattle are left free to wander during the dry season after the crops have been harvested.

Highland zones:

The mixed systems of the highlands have special features that justify their separate consideration:

- good soils and suitable climatic conditions, allowing higher crop productivity and consequently higher population densities;
- high cropping intensities and more or less permanent cropping patterns as a result of generally high population pressure;
- crops are grown unsuitable for the lowlands, such as wheat, barley, coffee and tea;
- crops and livestock are normally produced within the same management unit, hence approaching the concept of mixed farming;
- absence of trypanosomiasis; and
- ecological conditions suitable for the intensification of both crop and livestock production through the introduction of varieties and breeds from temperate zones.

Highland mixed systems are particularly important in East Africa, which has 70 percent of sub-Saharan Africa's highland area. Livestock and livestock products account for some 80 percent of mean farm cash income.

The animals are herded and grazed during most of the day. After the crop harvest, cattle are needed for threshing and grazing time for oxen reduces accordingly. Labour inputs to livestock production consist of efforts related to milking, barn clearing, manure collection, feeding, herding and watering, the dominant input being for herding. Animals are grazed private grazing land, communal grazing land and on the stubble of crops grown on family farmland.

Production Parameters of Cattle in Traditional Systems

Production parameters include the following:

- mortality risk, defined as the probability of an animal dying during a specified time period (one year for cattle);
- age at first parturition, expressed in months;
- parturition rate, defined as the number of parturitions per female per year;
- prolificacy, defined as the number of live offspring per parturition;
- milk offtake per lactation, defined as the milk used for human consumption (i.e. excluding that consumed by the calf);
- offtake rate, defined as the proportion of animals sold or consumed in a year; and
- mean live weight of breeder females and males (uncastrated adult males used for breeding).

These parameters determine the population dynamics and gross productivity. The gross productivity of livestock production systems is generally closely linked to the basic production parameters of fertility and mortality, the difference between which allows management decisions on the trade-off between sale, consumption and investment in herd growth.

Traditional systems are characterized by high mortality risks, low fertility rates, low milk offtake and low cattle offtake. Calf mortality risks are practically the same between pastoral (21.4 percent) and mixed (22.6 percent) systems. Since stock mortality is one of the most important parameters determining population dynamics and hence the gross productivity of livestock production systems, high mortality risks, especially among calves, is a major constraint in traditional cattle production systems in sub-Saharan Africa.

Cattle in traditional systems generally have a delayed mean age at first calving of 47.9 months, with a wide range from 33.4 months to 62.5 months. The mean ages at first calving are virtually the same in pastoral and mixed systems.

Calving rates in traditional cattle systems are low, at 58.7 percent (median of 58 percent). The mean calving rates for pastoral and mixed systems are similar, at 60.8 percent and 58.2 percent respectively.

Milk offtake per lactation in traditional systems is generally low, at an average of 252 kg (median of 251 kg). It ranges from 60 kg to 508 kg per lactation. The mean milk offtake per lactation reported in pastoral and mixed systems is virtually identical and very low.

The mean of reported offtake rates for cattle in traditional systems is 9.9 percent (median of 9 percent) and ranges from 1.2 to 20.0 percent. Mean offtake rates for cattle in pastoral systems are higher than in mixed systems.

The mean weight of mature cows in traditional systems is 244 kg (median of 250 kg), ranging from 152 kg to 357 kg. The mean weights of mature cows in pastoral and mixed systems are similar. Weights of mature cows are different across the sub-regions and across the systems. Mature cow weights the mixed systems in the semi-arid and subhumid zones are higher than those in mixed systems in the humid zone and in the highlands. The mean weight of mature bulls in pastoral systems (322kg) is similar to mixed systems (326kg).

Ranching Systems

Ranching systems consist of labour-extensive enterprises specializing in one or more livestock species and producing mainly live animals for slaughter (for meat, skins and hides), but also for wool and milk. Management is characterized by grazing within the fixed boundaries that delimit tenure. Ranches are generally commercial enterprises, with generation of a cash income as the primary function of the livestock raised on them. It supporting fewer people per land area, since tenure is generally individual (although not necessarily private) and providing options for intensifying water and feed supplies.

Ranching may take any of the following forms:

- Cattle ranching for meat (the most common type),
- Dairy ranching,
- Stud breeding.

Ranching systems can either hold both breeding and growing stock or specialize in rearing/fattening animals, according to environmental and economic conditions. Ranching systems are commonest in the arid and semi-arid zones of East and southern Africa and occur only sporadically in the drier parts of West and Central Africa. Ranches are also found in the humid zone of Central and West Africa but are not a predominant form of land use there. A few ranches are also found in the highlands.

Ranches generally exhibit improved herd, pasture and water management. Records are kept, herding patterns are closely adapted to the needs of different animal groups, and more external inputs are used (labour, purchased feed, inputs for animal health, etc.).

Smallholder Dairy Systems

Smallholder dairy systems may be characterized as mixed systems whose principal output is milk for sale. They are found mainly in the highlands. Smallholder dairy systems predominate in the high-potential highlands of Kenya and occur to a lesser extent in other East African highland areas. Livestock production is integrated with the growing of subsistence crops, such as maize, beans and potatoes, and of cash crops, including coffee, tea and pyrethrum. Besides engaging in crop farming and keeping other livestock, smallholder dairy farmers in Kenya also typically keep two or three dairy cows with their offspring which are mostly grade animals, but some are zebu or zebu x taurine crosses.

The herds are composed of 80 percent female cattle and 20 percent male (mainly young males). Breeding bulls are not important in this system and represent less than 1 percent of the total herd.

The farms practice zero grazing, free grazing or a combination of these. In general, land ownership is private rather than communal and livestock management varies from family to family, with some families keeping grade cattle under improved management regimes involving stall feeding, use of concentrates and disease control.

Production Parameters of Cattle in Non-traditional Systems

Beef systems

The mean calf mortality risks in beef systems located in the arid/semi-arid zones (10.2 percent) and in the subhumid/humid zones (10.1 percent) are similar. The mean replacement mortality risks are 10.0 percent and 7.8 percent, while the mean cow mortality risks are 5.7 percent and 6.2 percent in beef systems located in the arid/semi-arid and the subhumid/humid zones respectively. The mean age at first calving for beef systems in the subhumid/humid zones is 41 months, while no values are available for the arid/semi-arid zones. The calving rates in beef systems in the arid/semi-arid and subhumid/humid zones are similar, at 76.6 percent and 76.2 percent respectively. The mean weight of cows (414 kg) and bulls (495 kg) in the arid/semi-arid zones is higher than the mean weight of cows (309 kg) and bulls (440 kg) in the subhumid/humid zones.

Dairy systems

The mean calf mortality risks reported in the smallholder dairy systems are 12.4 percent and 15.9 percent for female and male calves respectively, while the mean replacement mortality risks are 9.1 percent and 22.4 percent for females and males respectively. The mean reported cow mortality risk in smallholder dairy is 5.2 percent, while the mean age at first calving is 48 months, the mean calving rate is 71.9 percent and the mean milk offtake per lactation is 2,050 kg. The mean weight of cows and bulls in smallholder dairy systems is 320 kg and 450 kg.

Mean calf mortality risk in large-scale dairy systems is 8.1 percent and 6.4 percent for female and male calves, respectively. The mean reported replacement female mortality risk in these systems is 1 percent, while the mean cow mortality risk is 4 percent. The mean age at first calving is 33.4 months and the average calving rate is 87.2 percent. The mean milk offtake per lactation in large-scale dairy systems is 3 911 kg, with a median of 3 195 kg and a range of 2 112 kg to 6 715 kg. The mean weight of mature cows and bulls is 414 kg and 450 kg respectively.

Methods of Determining Age of Cattle

The beef cow has relatively short life span. After their peak productive age, breeding market value usually declines as the animal gets older. Year branding or ear tag numbering are good methods of permanently identifying the age of cattle. These practices usually add value when selling bred cows. Buyers can bid with confidence on the age of cow they are purchasing. However, many cattle ranchers are unable to accurately identify the ages of their cattle.

The approximate age of cattle may be determined by examining the teeth. The tooth method of aging cattle involves noting the appearance and the degree of wear on the temporary and permanent teeth. The temporary or the milk teeth,, are easily distinguished from the permanent teeth by their smaller size and white colour. At maturity, cattle have 32 teeth, 8 of which are incisors in the lower jaw. The two central incisors are known as pinchers; the third pair are called second intermediates or laterals; and the outer pair are known as the corners. There are no upper incisor teeth; only the thick, hard dental pad. Becoming proficient at aging cattle by the tooth method requires practical experience and a lot of practice.

A second method of aging cattle involves reading the brucellosis tattoo in the right ear of female cattle. The tattoo (if legible) will reveal the year that the cow was a weaned calf and brucellosis vaccinated. The

first digit of the tattoo represents the quarter of the year that the animal was vaccinated. For example, a two would mean the animal was brucellosis vaccinated in April, May or June. The middle portion of the tattoo is a shield. The last number is the year the animal was vaccinated. For example, a 7 would mean the animal was vaccinated in 1997, as a calf. The calf could have been born in 1996 or during 1997. Brucellosis tags do not reveal the year of vaccination. The following are the guide to determining the age of cattle by the teeth:

Birth to 1 month: Two or more of the temporary incisor teeth present. Within first month, entire 8 temporary incisors appear.

2 years: As a long-yearling, the central pair of temporary incisor teeth or pinchers is replaced by the permanent pinchers, At 2 years, the central permanent incisors attain full development..

2 ½ years: Permanent first intermediates, one on each side of the pinchers, are cut. Usually, these are developed at 3 years.

3½ years: The second intermediates or lateral are cut. They are on level with the first intermediates and begin to wear at 4 years.

4½ years: The corner teeth are replaced. At 5 years, the animal usually has the full complement of incisors with the corners fully developed.

5 to 6 years: The permanent teeth pinchers are leveled, both pairs of intermediates are partially leveled, and the corner incisors show wear h show noticeable wear.

7 to 10 years: At 7 or 8 years, the pinchers show noticeable wear, at 8 or 9 years, the middle pairs show noticeable wear, and at 10 years, the corner teeth.

12 years: After the animal passed the 6th year, the arch gradually loses its rounded contour and becomes nearly straight by the 12th year. In the meantime, the teeth gradually become triangular in shape, distinctly separated, and show progressive wearing to stubs. These conditions become more marked with increasing age.

Handling of Cattle

Handling cattle always involves a risk of injury from crushing, kicking, butting or goring. The risk is increased if the work involves animals that have not been handled frequently. Certain jobs, such as veterinary work, may increase the risk further. However, proper handling systems, trained and

competent staff, and a rigorous culling policy can help ensure that cattle handling can be carried out in relative safety. Never underestimate the risk from cattle, even with good precautions in place.

The stockman

Everyone handling cattle should be:

- able to use the handling and other safety equipment provided;
- aware of the dangers when handling cattle and be supervised until they are competent;
- able to work calmly with the cattle, with a minimum of shouting, impatience or unnecessary force;
- in good health and properly trained in safe work methods.

Some work with cattle will need two people – always assess the need for help before beginning the task.

The equipment

Every farm that handles cattle should have proper handling facilities, which are well-maintained and in good working order. A race and a crush suitable for the animals to be handled are essential. Makeshift gates and hurdles are not sufficient, and will result in less efficient handling as well as risking injury. Never attempt to treat or work on any animal that is held by gates alone, or that is otherwise free to move at will.

The race

Check that:

- animals can readily enter the race, which should have a funnel end, and there is enough room in the collecting pen for them to feed into the funnel easily.
- animals can see clearly to the crush and beyond, so that they will readily move along the race, which may be curved, but should not include tight turns. Animals will be more prepared to move towards a light area than into the dark;
- the sides of the race are high enough to prevent animals from jumping over them, and they are properly secured to the ground and to each other;
- you can contain the lead animal in the race while it waits its turn in the crush. Hinged or sliding doors are suitable, but be sure they are operated from the working side of the race so the operator does not have to reach across it to close the gate. No one should work on an animal in the crush with an unsecured animal waiting in the race behind.

The crush

A crush which will allow most straightforward tasks to be carried out in safety (including oral treatments and work from the rear end, but not belly or foot trimming) will:

- have a locking front gate and yoke (ideally self-locking) to allow the animal's head to be firmly held. Additional head bars will prevent the animal tossing its head up and injuring people;
- have a rump rail, chain or bar to minimize forward and backward movement of the animal. Make sure this is always used;
- be secured to the ground or, if mobile, to a vehicle;
- be positioned to allow you to work safely around it, without the risk of contact with other animals, and have good natural or artificial lighting;
- allow gates to open smoothly with the minimum of effort and noise. Regular maintenance will help;
- have a slip-resistant floor, made of sound hardwood bolted into place (nails are not suitable), metal chequer-plate, or with a rubber mat over the base. Consider the need for shedder gates after the crush to allow animals to be sorted into groups. Work around the crush will be more convenient if it is under cover with a workbench nearby (for documentation, veterinary medicines, instruments etc).

Other equipment

Sticks and prods should never be used to strike an animal. Before beginning work on any animal, check that it will be adequately restrained from kicking. Consider whether you should use an anti-kicking device.

For specialist tasks such as foot trimming, use a purpose-designed crush, eg with foot restraints, belly winches and adequate space, especially at the rear end. Check that there are a minimum of trapping points so that if the animal kicks out, parts of your body will not be trapped against the crush.

Halters and ropes may be useful but will normally require specially instructed users. Always use suitable ropes - do not improvise.

The animal

Many cattle being handled will be familiar with the process - dairy cattle, for instance, will normally be handled daily. Make sure that heifers new to the milking herd, which may be less familiar with the

noises, activity and personnel involved, are allowed to become accustomed to them before they are first milked.

For an animal that is habitually aggressive or difficult to handle, consider whether you should cull it from the herd. If this is not an option, ensure your equipment and systems of work are capable of dealing with it, and that staff, and other people such as vets, are aware of the potential difficulties.

Some tasks may have to be carried out in the field without adequate handling facilities. Ear-tagging may pose particular problems as it may arouse the dam's protective instincts, resulting in risks to the stockperson.

Always make sure:

- there are at least two people present if you have to separate an animal from the herd in the field, or during ear tagging with the dam unsecured;
- you have a vehicle close to where the task is to be carried out;
- the second person acts to dissuade other animals or the dam from approaching too close to the task, and warns when it is necessary to take avoiding action, eg entering the vehicle.
- If you use portable or fixed field tethers for bulls in fields, make sure:
- the tether allows free movement with a minimal risk of entangling the bull;
- the connection with the tether passes through the nose-ring regardless of whether or not a head, collar or chain is used;
- you never make any connection direct to the nose-ring;
- the tether is secured to the ground;
- the bull's temperament is such that you can approach in safety to attach the handling ropes and poles before leading him back to the pen.

Controlling the bull out of the pen

When a stock bull has to leave the pen, use suitable equipment to secure and lead him. Consider breed, past handling and temperament to decide which of the following methods to use:

- two people, one using a bull pole attached to the bull's nose-ring and the other using a rope or chain attached to the halter or head chain via the nose-ring;
- two people both using ropes or chains, one rope or chain attached to a halter, the other either attached directly to the nose-ring or via the nose-ring to the halter;

- one person using a bull pole attached to the bull's nose-ring and a rope or chain attached to a halter, or head chain, via the nose-ring. Make sure there is a competent person standing by to help control the bull if necessary.

Bull handlers should:

- hold the bull pole, rope or chain firmly without exerting unnecessary pressure;
- keep the bull under observation;
- walk at a steady, slow pace slightly ahead of the bull; and
- keep the bull's head up at all times.
- check that handling, weighing, veterinary treatment and shedding arrangements are safe and designed for the often greater strength and volatility of a group of young bulls;
- arrange your race, crush and loading areas so that no one ever needs to be in them with the animals.
- A properly designed loading area will allow you to keep parts of the fixed handling system or the lorry tailboard gates between you and the animals at all times.
- Keep yard or farm perimeter gates closed when loading bulls to contain an escaped animal within the yard or farm.
- Never enter a pen containing, and never allow a lone person to handle, bull-beef animals.

Common Cattle Diseases and Prevention

African Sleeping Sickness (African trypanosomiasis)

It is also called Nagana disease and it's an infectious disease caused by protozoa (*Trypanosoma brucei* and *Trypanosoma congolense*). They invade the nervous system causing lethargy, drowsiness or sleepiness and finally death. The trypanosomes are spread from host to host via saliva by blood sucking tsetse flies. It is difficult to control, because many wild animal serve as a reservoir of trypanosomes. Prevention is dependent upon control of the tsetse fly vector by means of insect repellents, insecticides and bush clearing.

Heart Water

This is a tick borne disease transmitted by ticks and the causative organism is *Rickettsia rumenatum*. The imported cattle are more susceptible to the disease than the indigenous cattle. The disease develops rapidly within 24 hours and if not quickly treated the animal will die instantly. An intensive spraying programme will prevent the animal from coming down with the disease. The tick can create an open wound on the animal and predispose it to other attacks of agents of disease.

Streptothricosis (Kirchi)

This is a skin disease caused by the fungus *Actinomyces*. This disease is very common in the high plateau areas of the country e.g. Obudu, Mambilla and Plateaux cattle. Usually mortality from the disease is very low but it has a debilitating effect on the animal thereby reducing their productivity. Most affected animals are very unthrifty, if lesions are around mammary gland. The animal gradually wastes away. It is also difficult to milk the cow. The imported cattle breeds are highly susceptible. The N'Dama is known to be resistant to the disease.

Rinderpest (Cattle plague)

This is a highly contagious disease caused by a virus. It is common among the nomadic herds, but with a programme of immunization, the disease has been brought under control.

Brucellosis (Undulant Malta Fever)

It is a hidden disease but one of the most serious and widespread affecting the livestock industry. It is caused by *Brucella suis*, *Brucella melitensis* and *Brucella abortus*. The act of abortion is the most characteristic symptom in cattle. It is rather common in goats but rare in sheep. There is no successful treatment. It is controlled by eliminating infected animals and vaccination.

Tuberculosis

It is a chronic infectious disease caused by *Mycobacterium tuberculosis* of which there are three kinds namely: The human, The bovine and The avian (bird) types. Animals usually get tuberculosis of the lungs and lymph nodes in cows. The udder sometimes becomes infected and swollen in chronic cases. Often, infected animals show no outward physical signs of the disease. There may be loss in weight, swelling of joints and a chronic cough and labored breathing. Other seats of infection are genitals, central nervous system and the digestive system. No known medical treatment is effective with animals. It can be controlled by disposing of tubercular swine, cattle and poultry, applying strict sanitation and rotating feedlots and pastures. Also, pasteurization of milk and creamery by-products.