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**APH 509** – BEEF ANIMAL PRODUCTION

Lecture notes prepared by

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## **MATING IN BEEF HERD**

Mating: It is the physical meeting of the male and female animal for the purpose of parturition or giving birth. Before mating can occur, the female animal must be on heat

Types of mating

1. Natural
2. Artificial

Natural mating

This is the process of allowing male to mount on female animal on heat without assistance e.g. hand and pasture mating

Artificial mating

This does not require the physical meeting of the male and female animal e.g. artificial insemination. It is the method of introducing sperm into the vagina of the female

METHOD OF MATING

Three methods of mating

1. Hand mating

- allowing female animal to be served at owners discretion
- a cow on heat is brought to the bull for service
- practiced by pure bred breeders who wants to be sure of calf parentage
- ensures heifers are not mated prematurely

Advantage

- using a bull on more female
- help in keeping accurate record

Disadvantage

- it is labour intensive and expensive

2. Pasture mating

- traditional method that is common throughout the world
- bulls are allowed to run with female to be mated
- the number of cows a bull can service depend greatly on the types of pasture
- bull can serve 10-25 cows under range condition
- a bull can serve 40 cows on improved pasture
- under extremely sparse forage, a bull can serve 15 cows
- bull must be above 3 years

Advantage

- reduction in required labour
- cost of keeping a male is low

Disadvantage

- It leads to transfer of infectious disease
- heifer may be mated prematurely
- a female may be mated by more than one male, hence paternity becomes difficult to determine

3. Artificial insemination

- method of introducing sperms into the vagina of the female by artificial means
- female has no contact with the male
- rather less efficient with heifers than with cows because heifers rarely show estrous so clearly

Advantage

- It gives operator or the breeder access to bulls of genetic worth that he could never afford to purchase
- It facilitates crossbreeding program
- it eliminates disease spread by venereal contact
- Many offspring can be produced by a particular male in a given period

Disadvantage

- It requires more labour and experienced personnel

## **CATTLE NUTRITION**

Cattle are natural grazers. They possess remarkable ability to digest plant carbohydrates that are generally indigestible to most other mammals. It is natural then to assume that grazing is the best way to supply a nutrient-dense diet to growing cattle. Cattle would consume crop residues and forages and contribute manure to the soil. The widespread use of synthetic, soluble fertilizers and other agro-chemicals emerged in the 20<sup>th</sup> century. These materials, coupled with plant breeding technology and larger machinery for more efficient tillage and harvesting, led to high corn yields and cheap corn prices. Crop residues became part of main feedstuffs for grazing animals

### **PASTURE-APPROPRIATE ANIMALS FOR SUSTAINED CATTLE**

Matching the right animal or plant with the appropriate environment is a wise management decision that leads to healthy animals and a productive and a successful farming system, maternal traits, milking ability with early maturity and tenderness are important three traits because a cow must calve on pasture and raise a thrifty cow that lays down fat quickly

Qualities to be selected for in animals including herd bulls:

1. Dual purpose breed types (for beef)
2. medium frame
3. End weight 408-499kg
4. Age at slaughter 16 to 24 months (for beef)
5. Early maturing
6. Low maintenance requirements
7. High milk protein and butterfat (for dairy)

Cattle require consistent source of protein, energy, minerals, vitamins and water to maintain productivity and health

Producer can determine an overall picture of the nutritional status of the herd by:

- Using body condition scores
- Assessing pasture condition
- Soil and plant tissue testing to determine mineral and nutrient content (with subsequent appropriate supplementation)

## CATTLE NUTRIENT IMPORTANT IN CATTLE PRODUCTION

### ENERGY

Feed intake is regulated by an animals energy needs. Therefore, energy should be considered first when attempting to balance animal diets. Adequate energy concentration in the diet allows cattle to utilize other nutrients such as protein, vitamins and minerals

Major determinants of animal's energy requirements

1. Weight
2. Body condition score
3. Milk production
4. Rate of growth
5. Level of activity
6. Impacts of climate (heat, cold, humidity etc)

Fresh grass, with high quality grass-legume can meet energy requirement of growing or lactating cattle in the wet season. Energy supplementation on pasture helps in maintaining high grains and milk production. Dry cows can subsist on lower quality feed stuffs and maintain an acceptable body condition score in order to be successfully bred and deliver a healthy calf. Energy supplement such as grain can result in better protein digestion and therefore higher milk production and greater weight gains.

Forages have the ability to supply all the energy needed to maintain highly-productive cattle throughout the growing season, but only managed intensively. Legume-grass pasture will easily have a protein content greater than 18% during the vegetative stage. As plants mature, the nutrient values lowers. Consider getting your forage analyzed to determine nutrient content and concentration.

### PROTEIN

Cows generally require crude protein in the range of 7-14% of daily dry matter intake. Requirement is less for dry cows, pregnant and lactating cows especially dairy cattle require more. Growing cattle e.g. replacement heifers and steers require from 10.5-14% of their dry matter intake to be protein

### MINERALS AND VITAMINS

Principal mineral requirements are calcium and magnesium. Others are to consider are salt, phosphorus, potassium and sulfur. They are needed for cellular respiration, nervous system development, protein synthesis and metabolism, reproduction. Vitamins are important for formation of catalysts and enzymes that support growth and body maintenance in animals. Vitamin A supplementation should be included in the mineral mix at about 1,200 to 1,700 IU's (International units) per pound of dry matter of feed intake per day. Green forage, high quality hay and cereal grains are typically high in Vitamin E.

## WATER

Cattle require 3-30 gallons of water per day. One gallon of water per 45kg during wet season. Two gallons of water is needed during hot weather. Double estimates for lactating cattle. Water should be clean and fresh. Dirty water decreases water intake. Decreased water decrease nutrient metabolism. Factors that affect water intake include, age, physiological status, temperature, body size

Sources of feeds

- A. roughages
- B. concentrates
- C. Succulents

## ROUGHAGES

Possess great bulk, low nutrients and high fibre, digestibility is low, provide tactile stimulation, satisfy appetite and prevent digestive disturbances. Needs to be supplemented with other feeds high in nutrient concentration. Quality of roughage depends on the stage of maturity when cut, pliability of the stem, proportion of leaves, roughage include various classes of straw, low grade dried grass and hay

## CONCENTRATE

Feeds with low fibre and high nutrient concentration. Energy and digestibility values are high. Large variation in protein content such that concentrates are classified on this basis into low, medium and high quality. Cereal grains constitute the low quality protein group. Cereal grains are combined with feeds that are high in protein to make up for the deficit. Peas, beans and their residues are in the medium quality group (12-25% digestible protein). Meat, blood, liver meals, fish meals and dried separated milk (i.e dried skim milk where butter content has been removed). Their use is limited in beef production partly for economic reasons. Also, ruminants are capable of utilizing a low quality protein concentrate efficiently. Have great use in the production of monogastric animals.

## SUCCULENTS

Include green feeds such as young cereals but mainly root crops like yam, cassava, sweet potato, banana. Characterised by high moisture and fairly low dry matter contents. Roots have high % of easily digestible and metabolisable sugar. Protein content is very low and fibre is negligible. Fed with fibrous feed for normal functioning of the digestive system. Green feeds are suitable only when young as fibre contents increase with advancing age with a corresponding decrease in digestible protein

## FEED ADDITIVES

### FATS

Accumulated fat in processed carcass are suitable for livestock feed. But must be stabilised with suitable anti-oxidants, otherwise, they will become rancid and unpalatable. Example of anti-oxidants is Butylated Hydroxyly Anisol (BHA). Serves as sources of energy and reduce dustiness in ground dry ration. High levels of fat depress digestibility of other nutrients

## NON-PROTEIN NITROGEN

Examples include urea, biuret, creatinine, ammonium salts. These are synthetic compounds with high protein equivalence. Urea contains 46.7% nitrogen (27.3% crude protein). However, urea is not protein. In rumen, protein is synthesized by bacterial degradation of urea to  $\text{NH}_3$ .  $\text{NH}_3$  combine with carbohydrate fragments to form protein in bacterial cells. When urea is used, carbohydrate should be present to promote rapid growth in the rumen bacteria. Synthetic NPN could be toxic in concentrate form and thus be used with care. If used, a period of adjustment (2-6 weeks) has to be given so that the rumen microflora can effectively degrade them for subsequent protein synthesis. Microbial protein becomes available when the bacterial cells are digested

### MOLASSES

Low quality roughages, farm by-products, urea are unpalatable. Molasses addition

1. increases the palatability of the ration
2. supply part of the energy needed for rapid growth of the rumen micro-organisms
3. enhances effective microbial breakdown of the lign-cellulose fractions of the roughage portion of the diet
4. when dried ground feeds are used molasses reduces dustiness

### ANTIBIOTICS

These are medicine, drug or health insurance agents. The effect is to control the growth of harmful organisms. It makes the animal grow faster and convert feed into meat more efficiently. Examples Aureomycin, penicillin and terramycin. An ideal antibiotic for use as a feed additive must be

1. active against a wide range of detrimental organisms
2. Safe at high dosage levels
3. palatable at necessary concentration
4. readily absorbed and distributed throughout the animal's system
5. retained in the tissues long enough to be effective i.e. not easily excreted
6. stable both in feed and tissue i.e. not easily decomposed
7. it should not cause the microorganisms to become resistant
8. should be cheap enough to guarantee economic returns
9. must be easy and practical to feed

High levels of inclusion however, cause a depression in appetite, apparently due to partial destruction of beneficial micro-organisms in the rumen. Before including antibiotics in ration, the beef producer should study the costs, type of ration, health of the animal. Expert advice is usually necessary.

### HORMONES

Several synthetic estrogen substances are now used in beef cattle industry. They include diethyl stilbestrol, hexestrol and dienestrol, diethylstilbestrol generally referred to as the most extensively investigated of these estrogenic substances. The physiological properties of the female sex hormone and its action in animal body is similar to that of the natural sex hormone in both male and female. Several synthetic estrogen substances are now used in beef cattle industry. They include diethyl stilbestrol, hexestrol and dienestrol, diethylstilbestrol generally

referred to as the most extensively investigated of these estrogenic substances. The physiological properties of the female sex hormone and its action in animal body is similar to that of the natural sex hormone in both male and female. Summarized results of various tests indicate an average increase of 16% in weight gains and reduction in feed requirement of 12%

#### CONSERVATION OF GRASS FODDER

The need to maintain the nutritional status of animals at a satisfactory level throughout the year necessitates the provision of adequate feed during the unfavourable period e.g dry season. Seasonality of forage production necessitates conservation of grass during the rainy season for dry season feeding. The most common methods of grass conservation are silage and hay making.

#### SILAGE

Silage making is the process of controlled fermentation of succulent crops such that the growth of lactic acid producing organisms is favoured and that of other bacteria is suppressed. The quality of resulting silage depends on the period of fermentation. Ensilage is done by chopping the crop during harvesting by rapid filling of the silo by adequate consolidation and sealing. Grasses, legumes, whole cereals and fruit residues are used. Grass for silage making must have the following properties

- a. must neither be high in moisture content nor too dry. Moisture content of up to 70% is still considered suitable
- b. Sufficiently mature to contain above 28-30% dry matter, dry matter increased with maturity
- c. Grass must be rich in soluble carbohydrate e.g sugar to provide energy for the anaerobic bacteria fermentation which results in the production of lactic and acetic acid.

In practical feedings, silage replaces the roughage fraction of the ration and lessens grain consumption because

1. Well preserved silage is more palatable than most dry roughage
2. the concentrate present in the silage naturally tends to replace part of that in the grain ration

#### HAY MAKING

This is the cutting and drying of forages with a view to reducing the moisture content to levels conducive to storage. Drying should be accomplished rapidly to reduce dry matter losses through plant respiration. Handling should be carefully done so that the leaves which constitute the most nutritious part of the plant do not fall off. It can be done by field drying or barn drying. Barn drying is easier to handle but much more expensive. Hay cut when plants are high in protein and low in fiber is much better from nutritional stand point than mature hay. Method and length of drying and storage affect quality

#### PELLETED FEEDS

The pelleting of feeds is becoming popular as a means of ensuring uniform intake. This could take the form of all-pelleted ration or pelleted forages. The forage must be coarse

enough to allow for optimum cellulose digestion in the rumen, and prevent the incidence of digestive disturbances. Qualities of all pelleted rations are

1. Prevents selective eating
2. It reduces weight of feed
3. Reduces dustiness
4. Reduces labour and equipment
5. Lessens storage space

Advantages of pelleted forage

1. Reduction in transportation cost
2. Reduces dustiness
3. Reduces labour
4. Reduces nutrient losses
5. Makes automatic feeding feasible
6. Effective utilisation of low quality forage is ensured since preparation ensures complete consumption of the roughage

PELLETED FEEDS

Grasses

*Panicum maximum*

*Pennisetum pueperum*

*Andropogon gayanus*

*Cynodon dactylon*

Tree Legumes

1. *Leucaena* spp
  2. *Acacia* spp
  3. *Sesbania* spp
  4. *Ficus* spp
  5. *Gliricidia* spp
  6. *Gmelina* spp
- Forage Legumes
1. *Centrosema pubescens*
  2. *Stylosanthes*
  3. *Desmodium*
  4. Lablab
  5. Alfafa
  6. *Trifolium*
  7. *Tephrosia*

Concentrates

1. Cottonseed cake
2. Wheat bran
3. Copra cake
4. Maize offal and bran
5. Groundnut cake
6. Rice bran
7. Soybean cake

- 8. Palm kernel cake
- Agro-industrial by-products
- Cassava peels
- Yam peels
- Cocoyam peels
- Cocoa pod husk
- Coffee pulp
- Brewers spent grain (Dry brewers grain)
- Pito mash

### **GRAZING METHODS, USES AND PROBLEMS**

1. Set stocking: This is the least complicated and least productive system of grazing control. The cows are given access to a given area of pasture at predetermined stocking rate. No part of the grazing area is reserved for conservation but the pasture may be topped (a device for stimulating regeneration) with a moving machine during the grazing season. Its greatest disadvantage is a tremendous waste of forage involved as a result of trampling and soiling. There is consequently no provision for dry season feeding

2. Strip grazing: This is a method involving a short term grazing of pasture followed by long period of rest of varying duration. A limited grazing area is allowed each day behind an electric fence. By this type of restriction of the grazing area, conservation of part of the pasture or hay or silage is possible. The stocking rate depends on the estimated daily dry matter requirement of the animals. This system ensures efficient pasture utilization with little selection and wastage.

3. Rotational grazing: The controls of worms and ticks are also greatly facilitated. In most cases, however, efficient operation of the system involves a carefully worked out plan of fertilization with nitrogen to ensure a quick recovery of the pasture after the cattle would have been removed. The choice between strip and rotational grazing is largely a matter of convenience. The greater flexibility of the former appeals to the man with grassland in a form of permanent pastures. What is vital is to appreciate that both systems require a high stocking rate to achieve increased milk output.

4. Rational grazing : This system is an elaboration of Rotational Grazing advocated by the French man Andre Voisin. The system attempts to vary the rest period between grazing according to the season of the year. During the season of maximum pasture growth a smaller number of total available paddocks are rotationally grazed at frequent intervals and the rest is used for hay and silage making. The number of paddocks available for grazing is increased as the pasture growth diminishes. For instance, using 40 cows on 40 acres, there may be eight 5-acre paddocks only 4 of which will be grazed in rotation initially, then 6 and finally 8. The extra paddocks, having the mean time, been cut for silage and hay. Rotational Grazing is thus illustrated;

Grazing	P	A	D	D	O	C	K	S
Period	1	2	3	4	5	6	7	8
1 <sup>st</sup> -20 <sup>th</sup> April	<.....Grazed.....>							
Rainy season starts about	5 days on each paddock							

March

21<sup>st</sup> April - 11<sup>th</sup> May <.....Grazed.....><..cut for silage..>  
5 days on each paddock

12<sup>th</sup> May – 5<sup>th</sup> June <.....Grazed 4 days on each paddock..><...cut for hay...>

6<sup>th</sup> June – 30<sup>th</sup> June <.....,, ,, ,, ,, ..>

1<sup>st</sup> July – 1<sup>st</sup> August <.....Grazed 4 days on each paddock.....>

By this time (August) the pasture growth is already decreasing

2<sup>nd</sup> August - 3<sup>rd</sup> September <.....Grazed 4 days on each paddock.....>

4<sup>th</sup> September 13<sup>th</sup> October <.....Grazed 5 days on each paddock.....>

Such a system [Rotational Grazing] allows a "rest" period inversely proportional to the rate of grass recovery. Note: The above is for Tropical condition.

5. Split-herd and Creep Grazing: This is based on the concept that the physiological needs of different groups within a herd demand different grazing management to meet nutritional requirement since a herd usually consists of cows in early,-mid-,and late lactation,heifers being grazed with adult cows and so on.

[A] The method ensures that the high yielding cows are fed first by allowing rotational grazing at low intensity. They are known as "top grazers" and graze the better parts of the herbage. They are then followed by the low yielders or "bottom grazers" with less nutrient requirement. The sequence of the groups thus takes into consideration both the requirements of the animals and their account to which they turn the herbage i.e the purpose to which they utilize the herbage.

The sequence may be as follows:

- (a) Dairy cows
- (b) Fattening cattle
- (c) Young rearing stock(intermediate between calves and adult)

OR

1. High quality cows
2. Ordinary Dairy Cattle (1-2 years old heifer)
3. Dry cows and heifers more than 2 years old, horses, sheep etc

[B] The system is also adopted in the creep grazing of calves and young lambs as a means of satisfying nutritional needs and to control worm infestation. The younger animals graze ahead of their dam at low intensity while the dams are following at higher intensity.

C. The system is also used in the beef industry for fattening steers by allowing them to graze at intensity ahead of replacement heifers.

#### ZERO GRAZING(SOILAGE)

This is a long established system of grazing control. The practice is becoming increasingly popular as a result of intensification of grassland management and the improvement of machinery for harvesting fresh herbage.

The system is believed to achieve a reduction in herbage wastage caused by selective grazing and by trampling and fouling. The system involves yarding (confining) the herds all year round and cutting the grass during the growing season for direct feeding of the animals. It is expensive in equipment but saves fencing and laying on of water to fields while enabling fields too distant or inaccessible for grazing to be utilized.

Production per acre is claimed to be 7-10% higher by better utilization of the grass. It is however difficult to make conclusive statement about zero grazing since results of study vary from place to place.

Zero grazing does not always result in an increase in milk production and may in fact, result in slight reduction in yield.

Results indicate that the extent of reduction in herbage wastage and extent of such increase in production/acre that may result is greatest when tall crops, such as elephant grass and Giant star grass are compared to shorter forage Spp. Any advantages from zero grazing would also depend on the intensity of the FREE GRAZING (The animals are left to harvest the herbage on their own)system with which it is composed. Some results have indicated that:

i. yields/acre of energy in terms of TDN or milk production/acre has been reduced by zero grazing (grass cut and of energy in terms of TDN or the milk production/acre has reduced by zero grazing (grass cut and brought to the animals) can graze closer to the ground than is possible with machine harvesting.

ii. on the other hand, it is difficult to strictly compare free grazed animals since differences in the quality of consumed herbage may result from the ability of the grazing animals to select their diet.

iii. – animals requirement for energy is also smaller under zero grazing while differences in the quality of herbage eaten are also bound to exist. Reduction in energy requirement is that due to movement in search of and harvesting of the feed.

iv. –it has also been indicated that the digestibility of free grazed herbage is 2 units higher than that of zero grazing, principally due to the selective effect of the grazing animal.

iv. – there is also experimental evidence to suggest that rumen activity is less and digested nutrients are efficiently metabolized under zero grazing when compared to free grazing. Considerable energy is however expended in grazing and the extent of such energy expenditure is dependent on the quality of the herbage.

Good quality herbage is grazed relatively faster and cost less in terms of energy expenditure than low quality herbage. In the final analysis, it appears that the efficiency of energy utilization is less in FAVOUR of grazing animals than those zero grazed.

## USES OF ZERO GRAZING

1. It may be adopted if land is not abundant and stocking rate is higher (1/2 acre or less per cow)
2. To minimize wastage of herbage due to refusal of grass by cattle as a result of fouling with dung or urine
3. Where fencing or water supply is poor
4. Where most of the utilizable pasture is either inaccessible or too far from the dairy building and where expansion of adjacent pasture is limited by available space
5. To effectively ration available grass to different groups of animals where there is shortage of grass
6. It may be used where environmental conditions are unsuitable for grazing at certain times of the year e.g. when the grass is wet or the soil is muddy so as to avoid increased incidence of foot rot

## PROBLEM OF ZERO GRAZING

- (a) Efficient machine harvesting requires that grass be reasonably mature by which time a decrease would have occurred in the nutritive value of the grass. This thus, prevents the maximum utilization of pasture at optimum stage of growth and nutritive value
- (b) Lack of storage facilities or inability to keep harvest in pace with needs sometimes results in staleness. Piling up of harvested grass also results in heating and spoilage. It is therefore desirable but difficult to ensure that only daily requirement should be harvested and this should be fed in as many installments as possible to increase or maximize intake.

## ADVANTAGES OF ZERO GRAZING

- (a) It offers control over quantity and quality of grass fed
- (b) More farm space can be utilized for feeding
- (c) Allowance can be made for the requirement of different classes of animals.
- (d) It reduces fencing and water piping requirement for paddock
- (e) It saves time and labour required to graze animal to and from pasture especially where farm is very large

## DISADVANTAGES OF ZERO GRAZING

- (1) There is need for increased machinery and labour for harvesting the grass
- (2) No flexibility with respect to public holidays labour allocation
- (3) Increased labour is required to clear the yard and thus intensive handling of manure
- (4) Increased requirement for bedding materials since animals stay indoor all the time
- (5) Palatability of grass reduces rapidly after cutting and this may cause refusal and subsequent wastage

Zero grazing is becoming popular in Nigeria for the reasons that it serves:

- (a) A way out of the dangers of exposing imported cattle to solar radiation
- (b) A means of reducing the risk of diseases e.g. ticks, tsetsefly etc.  
There, however, had been some problems in its efficient utilization. These include  
-Lack of machinery

-Human and administrative problem e.g. overtime, public holidays etc

It is desirable especially for the exotic breeds of cattle in the afternoons. The economic aspects of its adoption has not been given serious investigation but it may be costly to operate on small and private farms. Generally speaking, rotation, strip and zero grazing are more practical and profitable on rotation and supplemental pastures than on permanent pastures, more productive with high producing dairy cows and more beneficial where parasite infestations are heavy.

## **FACTORS AFFECTING BEEF QUALITY**

### Management

Animals kept under an intensive management system perform better than those left to roam about in beef quality as the energy used in roaming about to feed is conserved in the intensive system.

### Age

Physiological age of the animal has a large impact on the meat quality of cow. Meat from younger animals is more tender than the meat from older animals. Meat from immature animals holds water between the muscles hence beef obtained from a fully matured cattle is of higher quality compared to those slaughtered earlier than its maturity age. Bone and cartilage characteristics are used to determine the maturity of a carcass. Cartilage of young animal is much more than older animals which is converted to bone as the animal ages. The texture of meat from more mature cows is much coarser than the texture of meat from younger cows. However, aging causes darkening of meat due to increased level of myoglobin.

### Slaughtering methods/techniques

The slaughtering method practiced in tropical countries causes an incomplete bleeding and makes the remaining blood to splash on the meat. When blood is found on the meat, this shows that the meat is not a quality one as meat is predisposed to microbial contamination. This method also affect hide and skin of the animal.

### Finishing

This refers to the amount, character and distribution of external, internal and intramuscular fat. For example, small amount of fat beneath the skin during dry cooking prevents beef from drying out. Therefore, too much fat on a carcass decreases the retail cut yield

### Nutrition

If cow are not fed with quality feed, this affect their beef quality. Feeds are converted into meat. The quality and quantity of feed affect beef quality. High variability in feed supplies affect the weight gain of grazing animals causing poor quality meat. Lack of improvements in crop yields and the competition between human and animals as well as brewing industries for the available grains makes nutritional requirement at reasonable cost more difficult to achieve since a viable livestock industry is interdependent on agricultural products.

## Disease factor

The beef industry is faced with insidious economic diseases such as mastitis, trypanosomiasis causing anaemia, emaciation, intermittent fever and poor condition, streptothricosis, endo and ectoparasites and some reproductive diseases leading to breeding inefficiency and infertility. A light helminth infection deprives calves of their vigour while a heavy burden results in marked reduction of weight gain, decreased feed efficiency and consequently poor condition or even death

## Marketing

The marketing system in this part of the world is not organized. There is no market information to show trend of supply, demand, current prices and even customers suggestion or complaints in beef bought. Nigerian consumers have not been known to request for a particular type of meat to change the given marketable products. There is also no standard for weighing or organized auction of live cattle or weighing of meat.

## Firmness

This refers to firmness of the flank area or lean cut surface. Carcass with more fat is firmer than that of muscle. A small amount of fat is desirable for optimum meat quality. A small amount of fat beneath the skin during dry cooking prevents the meat from drying out. Although, firmness makes no contribution to meat palatability. Firm retail cuts are more attractive because they hold their shape better. Firmness is also an important quality in cuts which will undergo extensive processing.

## Sex

Small differences in palatability have been observed between the sexes such that beef from bulls can be more variable and this is often associated with the higher variability in ultimate pH. Quality can also be due to heifers/cows having lower eating quality than bulls.

## Transportation

It is during transit that most death and tissue bruising occurs, muscle tissue shrinkage also occurs which causes reduction of weight and this affects meat quality.

## Heredity

Tenderness in beef may be up to 60% heritable. Livestock producer can make improvement to quality by careful selection of breed and strain.

## COST OF BEEF PRODUCTION

Profits in the beef cattle industry are determined by the total production and the prevailing market prices as well as the cost of production. Even when prices are favourable and production is high, attempts must be made of minimizing the cost factors or operational costs which are variable from place to place and also depend on managerial ability of the operator. Large amounts of capital are usually involved in the provision of land, buildings facilities, machinery and animals.

## MARKETING AND CONSUMPTION OF BEEF

Even though the animal protein needs of the population could be supplied by poultry, swine, etc., almost half of Nigerian's meat supply is beef. Beef supply amounts to about 3.62kg /head/annum,

compared with 1.78kg/head/annum of goat meat, 0.93kg of pork, 0.98kg of poultry and 0.78kg of mutton. It is estimated that approximately 10% of the Nigerian cattle population is slaughtered annually. The major cattle producing areas of West Africa stretch from Senegal to Chad, covering the boundaries between the coastal and the Northern States of Nigeria are part of the supply for the coastal areas.

The bulk of the beef consumed in the South comes from the North because of the limiting effect of trypanosomiasis on cattle production in the South, and for the fact that most of the cattle kept in the South are rarely used as a regular source of meat.

### Fulani and Shuwa Herdsmen

Itinerant cattle buyers.....>Intermediate cattle buyers



The diagram shows the scheme of the current marketing system from the producer to consumer. The actual ownership of trade change 6-8 times before final sales

The large and small towns and villages along or near cattle trade routes are well supplied with beef, as cattle unable to withstand the strain of a long trek are sold en route to avoid death losses. In places far from the trek routes slaughtering are at intervals depending on the purchasing power of the villagers.

In large cities like Ibadan, Hausa cattle dealers buy through their agents in Northern Nigeria and arrange transport to the South. The cattle are sold to wholesale butchers who slaughter and sell to retail butchers and contractors supplying institutions. The retail butchers then sell in the local markets. Since refrigeration facilities are in most cases lacking, slaughtering must be adjusted to meet daily demands. Available slaughter facilities lack proper drainage and the standard of hygiene is generally low. The animals are slaughtered without proper rating and carcass transport media are inadequate.

With the help of USAID, the modern central Abattoir at Ibadan was opened in 1972. Similar facilities are planned for other big centres of population throughout the country.

In most places, beef is not sold by weight and prices paid for similar or same joints depend on the bargaining power of the consumer. An assessment shows a range of N700-N800 per kg for the best cuts. The offals usually command higher prices as most people value these parts.

