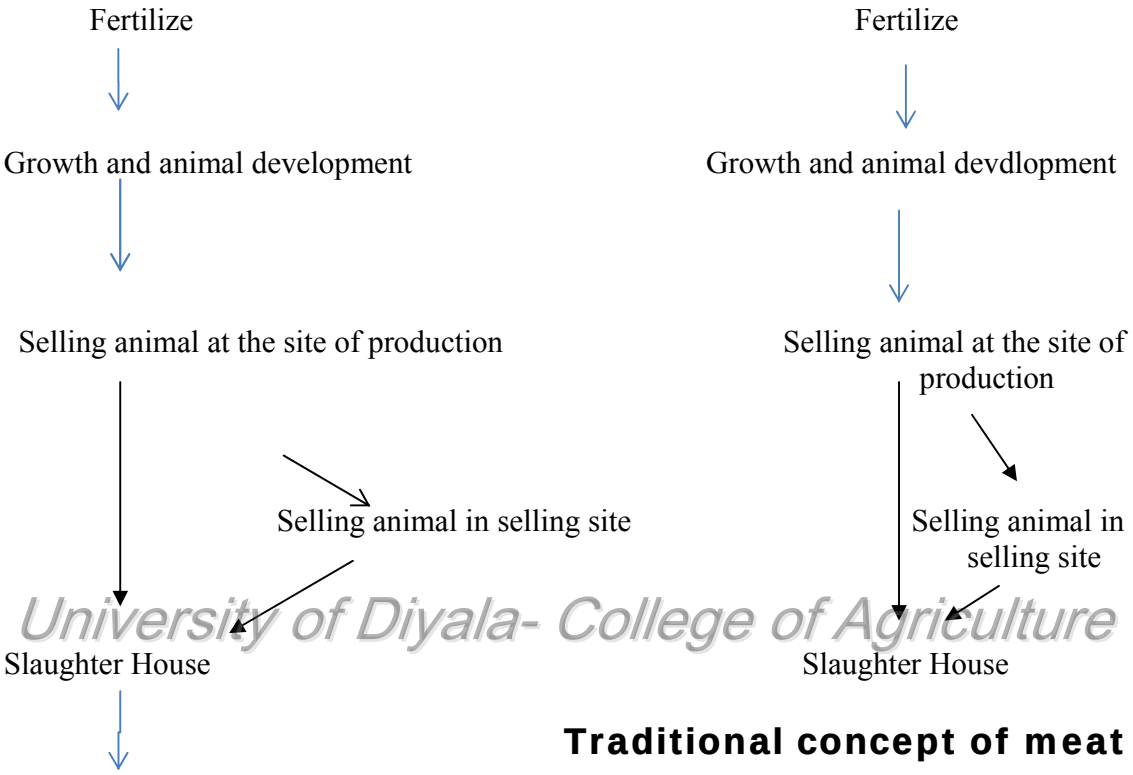
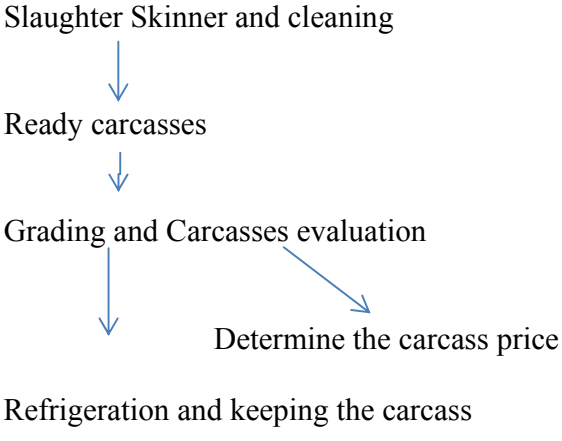
Especially concepts of red meat production

١- traditional concept of meat production

٢- modern concept of meat production



Traditional concept of meat production



Modern concept of meat production

Manufacturing Meat

SOURCES

The main sources of manufacturing meats are noted below.

A- Cattle

Cow

'Cow beef 'comes from animals at the end of their useful period of milk production, usually ٥-٨ years old at slaughter, when milk yield has begun to fall.

Calf

Milk production is a sequel to calving; male calves and many of the females are surplus to the requirement for new milk cattle. The surplus provides veal calves grown to ٣-٤ months.

Steer, bullock

Males grown to meat weights (٤٥٠ kg live weight or more); not usually available for manufacturing, except that in large meat plants they may provide trimmings and the less 'noble' cuts.

B- Sheep

Differences of breed or sex are not significant for manufacturing purposes, except that 'ram taint' or the meat of old breeding rams.

Classification and meat production in the world: -

١ – Traditional production: animals move and search for the pasture in this system the animals does not live in barns at all.

٢ - Semi-intensive production: the animals out to graze in the morning and return in the evening to the barn

٣ - Intensive production: In this mode the animals remaining always in the barn.

Classification and meat production in Iraq:

١ - The traditional pastoral style:

٢ - Production of animal and vegetable style:

٣ - Intensive production duo purpose:

٤ - Fattening barn system:

٥ - Contour of mode production:

Beef cow economics

١- High calf prices

٢- Low production costs

٣- Heavy weights for calves weaned

٤- High percentage of all cows must wean calves

٥- beef cow enterprise generally has low demands for labor and time

٦- Gaining a profit from this enterprise requires certain management and marketing skills.

Cattle Growth

'As an animal grows up two things happen: (i) it increases in **weight** until **mature size** is reached; this we call **Growth** and (ii) it changes in its **body conformation and shapes**, and its **various functions**; this we call **Development**'. The curve relating live weight to age has an S shape and is similar in sheep, cattle and pigs. There is a short initial phase when live weight increases little with increasing age: this is followed by a phase of explosive growth; then finally, there is a phase when the rate of growth is very low.

When animals are developing, a principal wave of growth begins at the head and spreads down the trunk: secondary waves start at the extremities of the limbs and pass upwards: all these waves meet at the junction of the loin and the last rib, this being the last region to develop.

The growth curve

If the weight of an animal is plotted against its age, an S-shaped or sigmoid curve is produced (Fig. ٢.١). The weight increases slowly at first, the rate of increase reaches a maximum and then decreases so the increase in live weight with age in old animals is small. This shape of growth curve can be derived for most animals. The point of **inflexion**, where the curve changes from **concave to convex**, occurs at the **maximum growth rate** and is therefore referred to

as the maximum point of growth. Food consumed by the animal is used for two processes: the **maintenance of existing tissues and the growth of new tissue**. As growth is fastest at the maximum point of growth it is also most efficient because the proportion of the total energy available to the animal that is used for maintenance of its body is relatively least. **The maximum point of growth is where the two forces balance**. This occurs at puberty in mammals. Normally this is at about ٣٠٪ of mature weight and that puberty occurs at ٦٠ to ٧٠٪ of mature weight

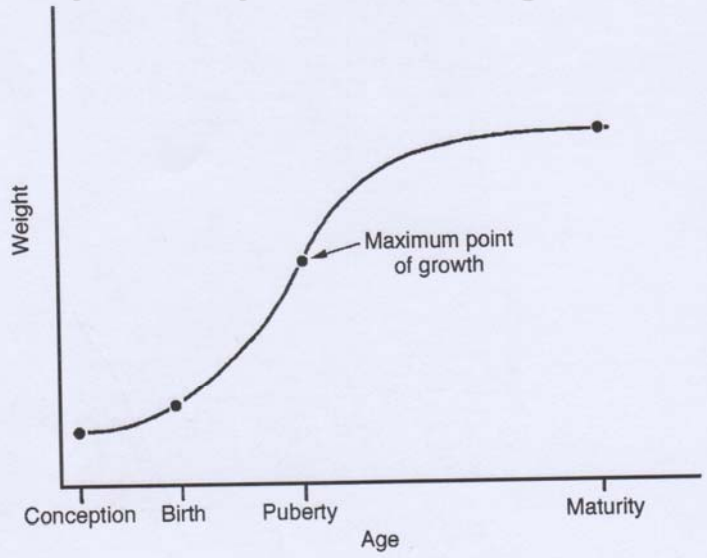


Fig. 2.1. The relationship between the weight of an animal and its age.

Factors influencing the growth and development of meat animals

١- Genetic aspects

Genetic influences on the growth of animals are detectable early in embryonic life. That there were already differences in the rate **of cell division between the embryos of large and small races** in birth weight of cattle and sheep.

The birth weight is influenced by the age, size and nutritional state of the mother, by sex, by the length of the gestation period and ٥ months in sheep, and ٩ months in cattle and by the **numbers of young born**

٢-Environmental physiology

The subject of **heat regulation** in farm animals has a wide economic significance. Sheep, cattle attempt to **maintain** their body temperature at a constant value which is optimum for **biological activity**.

The environmental temperatures normally tolerated by **living organisms lie in the range ٠–٤٠°C,** but some animals habitually live below the freezing point or above ٥٠°C.

A general growth curve

Let's imagine Figure ٢a-١ is the growth curve for a typical **steer** from birth to maturity, with adequate nutrition to meet his basic needs:

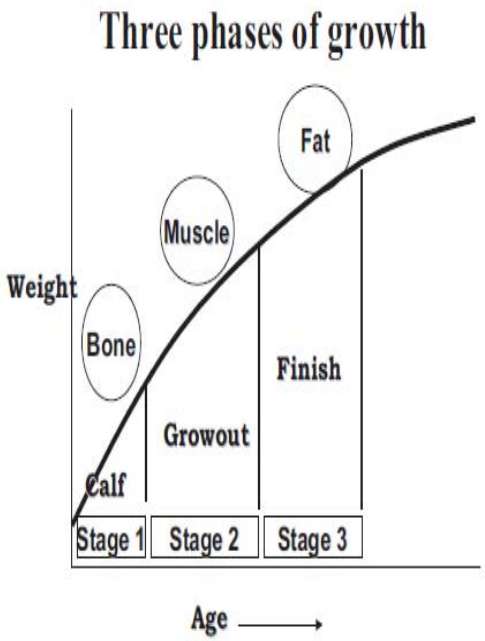


Figure 2a-1. General growth curve

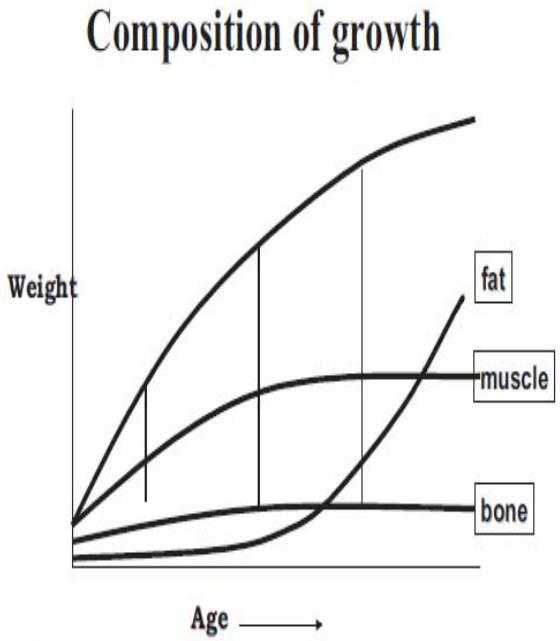


Figure 2a-2. Composition of growth

Stage ١ - Birth to weaning (say ٦-٧ months)

After birth, **bone growth is first priority**, to establish frame for **future body growth**. **New muscle cells are being formed and muscle weight** increases rapidly. **Fat is only deposited in small quantities**.

A calf requires **nutrition of very high quality** to develop bone and muscle, and this is mainly **ensured by milk from its mother**. **Inadequate nutrition at this stage affects future development.**

The carcass at this stage has a **high bone content, high muscle, low fat, with low gut weight**.

The meat from calves is **tender, has little hard connective tissue, and not much flavor**

Stage ٢ - Growing out

In mid growth (say after weaning at ٦-٩ months) **bone growth continues but the animal's main priority becomes muscle growth.** Normally, **fat is only deposited in small quantities**. This is the "backgrounding" or "growing out" phase.

The growing animal requires **high quality protein-rich diet**, and the rate of **development during this phase is very sensitive to feed quality**.

After weaning, gut weight increases markedly to cope with digesting roughage diets – this keeps **dressing percentage down**. The **carcass itself has an increasing ratio of muscle to bone**, and **very little fat**, so generally **has a high yield**

(Percentage of saleable meat).

Meat is tender at this vealer / yearling stage, and has more flavor. **Fatter animals generally have better eating quality**, with less risk of cold shortening and **enhanced juiciness from small amounts of marbling**.

Stage ٣ - Finishing / maturing

When growth of **bone is largely completed and all muscle cells have been established**, all that is left is for muscle cells to fill out, and after that, surplus energy **is stored as body fat.**

As animals **mature, they can exist on quite poor quality** feed, but if **feed quality is good, they can express their muscle potential and accumulate fat very quickly.**

As fattening takes place, **fat is deposited in the gut and carcase depots (subcutaneous or selvedge fat, intermuscular or seam fat, and intramuscular or marbling fat).**

The carcass becomes an increasing proportion of the total body, so dressing percentage rises. The yield of **saleable meat in the carcass falls as the need for fat trimming rises**.

Meat flavour reaches its maximum in the prime cuts of a mature, finished steer, **but as connective tissue increases with age**, there is a **decline in tenderness**, especially in the secondary cuts.

Cattle with different growth curves

١- Sex

Heifers – **given the same access to nutrition as steers**, heifers **grow a little less bone, considerably less muscle, and put on considerably fatter**.

They follow a "**flatter**" growth curve with an earlier end point. **Are earlier maturing**.

Bulls – they grow more muscle and bone, and are less inclined to put on fat. They have a **longer period in Stage ٢** and **greater amount of muscle in Stage ٣** – they are **later maturing.**

٢- Frame size

Large **framed cattle grow to a higher mature weight** and take a little longer to reach mature weight (**later maturing**).

Small framed cattle grow to a **lighter mature weight** and get there earlier (**earlier maturing**).

٣- Muscling

Heavily muscled cattle at the same frame size take a little longer in Stage ٢ to fill out their muscling, **and carry more muscle and less fat later in life**. They are heavier, and effectively **later maturing than average-muscled cattle of the same frame size**.

Lightly muscled cattle are like heifers, and finish their muscle growth earlier and at a **lighter weight**, putting the **surplus into extra fat**.

Cattle that are both large framed and heavily muscled, such as **most European breed types can be very late**

maturing. This means they are **very difficult to fatten at lighter** weights, and need to be carried to very heavy weights to finish adequately.

Maturity and market specifications

Market specifications are mainly described in terms of **age, sex, weight and fat depth**. As most of our target markets focus on **young growing steers**, **weight and fat depth are the two main factors to think about**.

It is therefore important to know what makes cattle put on **fat faster or slower as they grow**.

This will determine whether they are “finished” and meet the target specifications for any particular market.

Changing the growth curve for a particular animal

There are many factors which can change the actual growth path of a particular animal, and therefore arrive at different **combinations of weight and fat depth**, to determine market suitability. The **main factors are nutrition and genetics**

Nutrition

Nutrition in Stage ١

If **nutrition is better** than adequate, it allows full **development of potential bone and muscle**, and may even allow some **surplus to be deposited as fat**. Such calves are **highly sought after for slaughter as vealers at ٧-١٠ months**. If they have **adequate frame size** and **muscling**, they still have the potential to grow on and **mature at heavy weights**.

On the other hand, **severe restriction** in Stage ١ **results in impaired bone and muscle development** – these calves **don't catch up when they are put on good feed later**, and will **produce carcases with lighter weight, less muscle and more fat**. Be wary of buying lightweight (**say under ١٨٠kg**) to finish, and be aware that early **weaned calves requires special attention to their nutrition**, to ensure they retain their potential.

Nutrition in Stage ٢

Cattle receiving better than their basic requirements for growth in Stage ٢ can **produce plenty of muscle and deposit some fat.** Most of our table beef quality domestic and export cattle are **slaughtered in this stage of life, around ٥٠- ٧٠٪ of mature weight**. **High quality pasture, forage crops or feedlots** will provide the **good**

nutrition required to finish cattle while they are still actively growing.

Restriction of nutrition in Stage ٢ affects the **size of muscle fibres**, but if they **have had a good start in life** this will be **temporary and reversible**. **On returning to good feed they will recover, expressing compensatory gain**. **Fat deposition will be delayed a little**, **resulting in leaner**, **higher yielding carcases**. These benefits are used by cattle finishers to enhance their profit.

Nutrition in Stage ٣

In Stage ٣, cattle finish **the development of their bone and muscle structure**. They can gain or lose **weight according to available nutrition**, with the main effect being on the **proportion of body fat.**

Recovering from **poor condition, they fill out their muscles first – this happens quickly when they have finished growing - and then put the surplus back on as fat**.

Mature cattle are very easy and quick to finish, **once relieved of their breeding responsibilities**, provided of course that they are sound (especially teeth) and healthy.

Virtually all steers are slaughtered before Stage ٣, so the main cattle in this group are cull females and bulls.

Describing growth

The rate of growth can be described in different ways. The *average growth rate* over a period of time is calculated by dividing the increase in weight over a particular time period by the length of that period:

Average growth rate = $w_2 ! w_1/t_2 ! t_1$,

where w_1 is the weight at the start of the period (t_1) and w_2 is the weight at the end (t_2). This method gives the growth rate in terms of g day$^{!1}$ or kg week$^{!1}$ for example. The *relative growth rate* is calculated as the increase in weight over a period of time divided by the initial weight:

Relative growth rate = $w_2 ! w_1/w_1$.

This gives the growth rate expressed as a proportional increase, for example a percentage, over the defined time period. The sigmoid curve derived by plotting absolute weight against age is only one way of showing growth. Plotting the average growth rate or the relative growth rate against age produces different types of curve (Fig. ٢.٢). The plot of average growth rate shows that the animal grows fastest in the period in the middle of its life. However, relative growth rate decreases progressively throughout life, the increase in body mass, expressed as a proportion of that already existing, reduces with time.

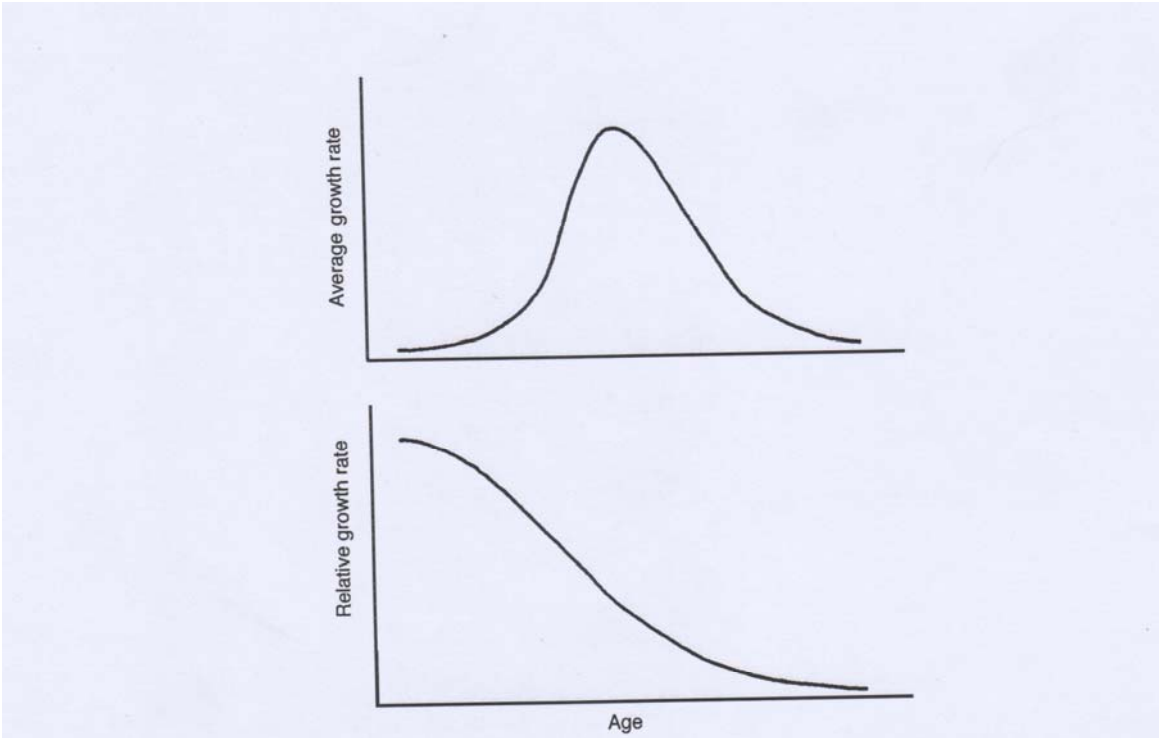


Fig. 2.2. The relationships between average and relative growth rates and age.

Up normal growth

Certain major growth features in cattle are known to be due to recessive genes. One of these is **dwarfism** where the gene concerned primarily affects **longitudinal bone growth and vertebral development in the lumbar region, and males rather than females.**

Another is **doppelender** development the gene concerned being. Neither has so far proved controllable. The

doppelender condition – referred to as '**double muscling'** in Britain and the USA,. The higher commercial value of **doppelender animals arises from their higher dressing percentage** (and **higher muscle: bone ratio**), the composition of the carcass (**which has relatively less fat and offal),** There is a greatly **increased number of muscle fibres in the meat** of double muscled cattle.

In such cattle **myoblasts** appear to have been increased at the expense of **fibroblasts**. **Increase in fibre diameter** is less important in contributing to muscle enlargement than the increase in fibre numbers in double muscling

Reproduction

Anyone trying to show a profit with a herd of beef cows must make sure that every female, two years old and older, raises a calf and rebreeds in a timely manner every ١٢ months. To do this, you need to **understand how health and nutrition affect the reproductive physiology of beef animals**.

Goals

Besides the goal of having each breeding-age female calves every ١٢ months, you need to set some other reproductive goals for your cowherd, such as:

١- Getting heifers bred to calve on or just before their second birthday

٢- Shortening the calving season to ٦٠ days

٣- Getting a high percentage of the cows to settle during the first ٢١ days of the breeding season

٤- Getting a high percentage of each year's calf crop from Artificial insemination AI service

Body condition score

Evaluating a cow's body condition near the time of calving will clue you as to whether better nutrition will be needed to get her rebred in a timely fashion.

Body condition score (BCS) is a subjective numerical scale that represents the amount of external body fat a cow possesses. It ranges from ١ (very thin) to ٩ (very fat). Aim for cows with a BCS in the range of ٥ **to** ٦ during **the last trimester** of pregnancy. Feeding cows to BCS of ٧ **or more** will needlessly **increase feed costs**, while a BCS of **less than** ٤ will **seriously jeopardize breeding performance**.

Dystocia

Dystocia (history of difficult birthing) can also cause cows and heifers to breed later in the breeding season. No matter

what their age, **cows with dystocia are slower to come back into heat than cows with no dystocia**. While there is little **you can do to prevent dystocia (though using bulls that sire light birth weights will help**), realize that cows **experiencing dystocia will most likely be later to breed**.

Female reproductive tract

We need a basic understanding of the reproductive system to be able to understand reproductive problems and solutions.

The primary reproductive organ of the cow is the **ovary**. The ovary produces the **egg** or **ovum** and two hormones, **estrogen and progesterone**. The egg, once fertilized by sperm, develops into the **embryo**. The hormones help prepare the **egg for fertilization and maintain the pregnancy**.

The **estrus** or reproductive cycle of the beef female usually occurs over a **٢١-day** period, but may **range from ١٧ to ٢٤ days**. The purpose of this cycle is to **prepare the egg for ovulation and the female for estrus** (the period of sexual receptivity). Once the **egg is ovulated** by the ovary, it proceeds to the **oviduct where it is fertilized** if viable sperm are present. Because the egg is capable of

fertilization for only a few hours, fertile sperm must be **present very near the time of ovulation**.

During the next ٣ to ٤ days the egg proceeds through the oviduct into the uterine horn. If it is a fertilized egg, it begins **embryological development.** Unfertilized eggs **degenerate and disappear**. Any resulting embryo will spend the entire gestation period in the uterine horn and receive **nourishment from the cow through the membranes of the placenta**.

The rearing of replacement heifers

Targets for rearing

Up to a point, the two main requirements in rearing replacement heifers are (١) that they should grow at a rapid rate and (٢) that they should calve at as early an age as possible. The former obviously influences the latter to a certain extent.

Rapid growth

The replacement heifer **needs to grow** so that she becomes able to **reproduce efficiently and to produce reasonable quantities of milk**. Just before first calving, **slower growth** during the **winter** months is also acceptable, since **compensatory growth can occur on the cheaper feed provided by grazing the following spring**

Early age at first calving

The earlier that heifers calve, the sooner **they can replace cull cows in the milking herd** and **the quicker will be the rate of genetic gain in the herd**. Today the target age at **first calving** is approximately **two years**.

The earlier replacements calve, the fewer there will be on the farm at any one time. In a ١٠٠-cow herd with a ٢٥٪ replacement rate, for example, there will be around ٧٥ replacements due to calve at three years of age, **but only** ٥٠ if they will be **calving at two years**. Consequently, if **replacement heifers calve at an earlier age** they will overall be less of a drain on the farm's resources, so that they could **be used to support more milking cows** or other **enterprises.**

It is true to say that, within limits, the **earlier in life that heifers start to produce milk**, the higher will be their lifetime production. Finally, it seems that if heifers are too **old at first calving**, they may be more likely to **suffer dystocia**, perhaps because of **excessive weight gain**.

Selection for Breeding

The choice or selection of **parents** to create future **generations** is obviously of crucial importance in

determining the future **productivity of the herd** and may also have an impact on future **reproductive performance**. Individual bulls can be used to sire a large number of calves. A bull used in natural service may serve up to ١٠٠ **cows per year** and an Artificial insemination **AI bull** may sire up to ٥٠ ٠٠٠ **calves per year**. The selection of suitable bulls to pass on their genes to future generations is thus of **paramount importance**. However, the **correct choice of cows** from which to produce calves can also have an impact.

Genetic inheritance

The characteristics exhibited by an animal – its phenotype – e.g., **milk yield and growth rate, are dependent** on two factors:

(١) The genes that it inherits from its parents, i.e., its genotype

(٢) The effects of the environment in which the animal is kept.

These two factors are commonly referred to as **'nature' and 'nurture**', particularly in the human context

A particular characteristic or phenotype may be **qualitative or quantitative**. Qualitative traits are absolute, e.g., **coat colour**, and are usually **controlled by one or a few genes**. **Polledness** in the Aberdeen Angus breed is an example of a character determined by a single gene.

Quantitative characteristics, **such as milk yield and growth rate, are widely variable,** and these tend to be controlled by **a larger number of additive genes. Thousands of different genes control milk production, affecting** a large variety of factors which together influence production.

These factors include **food intake**, **metabolic efficiency and the partition of nutrients between mammary and other needs**.

The objective of the cattle breeder is to produce animals that have inherited, from their parents, combinations of genes that **influence production and conformation** traits in a desirable way. In general, the **breeder aims to produce animals of equal or improved performance to that of the parents.**

The fertilization is the process by which the maternal and paternal pronuclear, each containing the **haploid number** of **chromosomes (٣٠)**, fuse to form the zygote containing the diploid number (٦٠) of chromosomes. Thus the embryonic calf receives chromosomes,

Genetics

Breed effects

The main breed effects on **maturity and carcase composition** can be explained in terms of **muscling and frame size**. Be aware that generalizing is dangerous - there is a wide (and growing) variation **between animals within each breed in frame size and muscling**.

Some breeds generally have larger frame size e.g.

Breeds which are strong in muscling (high muscle to bone ratio) produce **higher yielding carcasses and are often prominent in carcass competitions**.

Breeds which are both **large framed and heavily muscled will be very late maturing.**

Selection within breeds

It is very difficult to breed to a maturity type if you select your bulls **by eye**, because what you see - **their frame, muscle and fatness** – are strongly **influenced by non-genetic aspects of their upbringing**.

Heritability

Some of the more important traits for beef and milk production are shown in Table ١٥.١. Heritability expressed in **percentage terms, is a measure of the degree to which a particular trait can be influenced by genetics**. The higher the heritability of a trait the **easier** it is to improve

that trait by **genetic selection**. For example, the heritability of milk yield is regarded as moderate, whereas those of beefing traits are relatively high.

In general, **as the number of traits selected at any one time increases**, so the **heritability of each is decreased**

Table 15.1 Heritability estimates of some important traits in cattle.

Trait	*Heritability (%)*	*Reference*
Dairy		
Milk yield	25–35	a
Total solids	25–30	a
Fat yield	25–35	a
Protein yield	25–30	a
Lactose and minerals	25–32	a
Solids not fat yield	25–30	a
Fat percentage	50–60	a
Protein percentage	45–55	a
Total solids percentage	50–65	a
Solids not fat percentage	55–65	a
Fore udder attachment	20, 29	b, c
Udder support	16	b, c
Udder depth	29, 33	b, c
Beef		
Birth weight	40	d
Weaning weight	30	d
Yearling weight	50	d
Feed conversion efficiency	40	d
Conformation	40	d
Carcase fat cover	50	d
Saleable meat yield percentage	40	d

Specific objectives in dairy cattle selection

These include:

(١) The increase in milk yield and its compositional quality

(٢) The improvement of conformation including udder and feet

(٣) The improvement of beef merit

(٤) The improvement of fertility.

Traits selection

Cow/calf producers design **beef products by the breeding and selection decisions they make**. The breeds you choose to use in your program **determine the size, growth rate, milking ability, market finish weights, and reproductive efficiency of the cattle you raise**. Cow/calf producers have traditionally made most of their profit by **keeping cow maintenance cost low and reproductive efficiency high**. While there will be **increasing pressure to improve and develop the carcass characteristics in cattle**, the **production efficiencies will still be primarily determined by cow unit production cost and high reproductive performance**.

Optimum performance requires a **balance between reproductive performance, growth traits,** and **desired market specifications**.

Calves with higher-than-average birth weights are more **likely to die** due to **birthing difficulties**. Also, **difficult births tend to reduce the breeding performance of the dams**. On the other hand, calves that are **lighter than average at birth** are more likely to **die of various stresses**. So, to maximize calf survival, your goal as breeder would be to aim for **intermediate birth weights, and to optimize the calves' growth through good management**.

Reproductive traits

Maximum profit in a beef herd is associated with **high reproductive performance.**

Genetic improvement from selection is slow. You should **focus on improving the environmental factors** that affect reproduction, such as **nutrition, disease control, and management.**

Your goal should be for **every cow to wean a calf every ١٢ months**. For the **best reproductive performance** of your herd, you need **to balance the nutritional limits of your operation against the nutritional needs of your herd**. These needs are based on the **size of your cows and their level of milk production**. If resources become limited, **larger cows are often the first not to breed**. High-milk-producing cows also **require more feed to**

maintain themselves and reproduce efficiently. Poor fertility rates are a red flag of caution that cow size and/or milk production rates in cows may be exceeding the nutritional limits of a given production environment.

Growth traits

Growth traits are easily measured. Since producers are paid by the pound, growth traits have a clear impact on the beef enterprise's profitability.

Birth weight

Birth weight is a useful indicator of calving difficulty. Selection of breeding animals for **smaller birth weights appears to be an effective criterion for improving calving ease**. But to **balance birthing ease with optimal growth**, you should ideally select for **moderate birth weights with high growth potential**.

Weaning weights

Weaning weights are obtained to **evaluate differences in mothering abilities of cows and to measure growth potential in calves**. Weaning weights are generally adjusted to a **common age (٢٠٥ days) and then calves from similar management groups and of the same sex can be compared with each other to identify the faster**

growing calves, or calves from the heavier milking cows.

Yearling weight

Yearling weight is used to **estimate growth potential in cattle**. It also has a **high genetic association with efficiency of gain**. How an animal is **fed between weaning and yearling measurements can greatly influence yearling weight.**

Bulls are often fed moderate- to high-concentrate rations to support a maximum growth rate and allow them to develop to their fullest genetic potential. It is generally more practical to develop replacement heifers on a **lower feeding regime which keeps them growing, but not getting fat**.

Carcass traits

Carcass traits are also important in beef production. In the future there will be increasing **pressure to breed cattle with more predictable and uniform carcass characteristics**. **Increased selection for lean, extremely heavily muscled cattle** could be offset by **lower fertility rates, calving difficulty, and lower milk production**

Nutrition

Of the factors that influence the **growth and reproductive performance of beef cows**, **proper nutrition** is probably the most critical. Because **feed costs represent over half the total cost in a cow–calf production system**, it is very important to keep feed costs low while meeting your animals' nutritional needs. Vital nutrients in beef cattle diets include **water, energy, protein, calcium, phosphorus, potassium, sodium, trace minerals, and vitamins.**

١-energy and protein

The **primary nutrients of concern for beef cattle are energy (referred to as "total digestible nutrition," or TDN) and protein (also called "crude protein," or CP).**

The nutrient requirements vary due to **weather, environment** (muddy lots), **age of cattle** (young and old cattle require more energy), **cow size, cow milking ability, stage of production, and body condition** (fat cows require less energy and thin cows require more energy).

٢- Mineral and vitamin supplements

Diets must be evaluated for other requirements besides energy, protein, and roughage.

Environmental Effects on Feed Intake and Production

Feed intake in beef cattle is **affected by temperature, precipitation, wind, mud, and other factors**. Animal **adaptation or susceptibility to stress also is factors that may influence intake**. The duration of adverse conditions is important to know to determine at which point more serious **effects on animal condition and performance will occur**.

Direct Effects of Climate

i. Effect of High Temperature:

Exposure of beef cattle to temperature above ٨٠oF (٢٧**oC) results in activation of the thermoregulatory mechanisms of the body**, resulting in **increased respiration and vaporization rates**. At temperature above ٩٥oF **(٣٥oC) there is failure of heat regulatory mechanism with consequent rise in rectal temperature, increase in water intake**, **reduced appetite**, **reduced growth and milk reduction and possible losses in body weight**.

ii. Effect of High Temperature on Grazing Habits

High temperature reduces the length of day time grazing of cattle.

iii. Effects of High Temperature on Growth

This is due to effect on grazing time and feed intake.

iv. Effects of High Temperature on Milk Production

It depresses milk production and affects milk composition.

v. Effects of High Temperature on Reproduction:-

High testicular temperature adversely affect **spermatogenesis** and hence, the fertility of the bull. There may be seminal **degeneration**.

vi. Effects of High Humidity:

Humidity is the amount **of vapor in the atmosphere**.

(a) High humidity's add to the heat load of the animal by reducing evaporative heat loss

(b) High humidity's also depress the amount of daylight grazing

(c) High humidity's have some effect on feed intake (reduce it) and hence reduce productivity.

(d) High humidity's lower the dry matter content of forages i.e. there would be high moisture content and low DM content.

INDIRECT EFFECTS OF CLIMATE

Effect on Feed supply:

Climate affects the **quantity and quality** of feed available to the animal. This is because **plant growth** is dependent

on **temperature, precipitation and the length and intensity of day light while the quality of the feed is affected by precipitation and humidity**.

Tropical **forage matures quicker** so that at the **same age as the temperate type**. It has a **higher crude fiber content and lower digestible nutrients but quicker maturity**. Thus tropical stocks have to digest **more fibrous feed with resulting increase in heat load**.

In **areas with high humidity**, there is **rapid deterioration in quality of mature forage**. This is however **less intense in drier area**.

In the humid and super-humid zones, forage contains such **high water content and become so bully that the animal is unable to ingest a sufficient quantity containing enough dry matter to satisfy nutrient requirement**.

FACTORS AFFECTING BEEF QUALITY

١- 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.

٢- Age

Physiological age of the animal has a large impact on the meat quality of cow. Meat from younger animals is tenderer

than the meat from older animals. Meat from immature animals holds water between the muscles hence beef obtained from 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 are 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.

٣- 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 affects hide and skin of the animal.

٤- 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

٥- 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 affects the weight gain of grazing animals causing poor quality meat.**

٦- Marketing

The marketing system in this part of the world is no organized. There is no market information to show trend of supply, demand, current prices and even customer's suggestion or complaints in beef bought.

٧- 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 make no contribution to meat palatability. Firm retail cut are more attractive because they hold their shape better.

Firmness is also an important quality in cuts which will undergo extensive processing.

٨- 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.

٩- 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**.

١٠- Heredity

Tenderness in beef may be up to ٦٠٪ heritable. Livestock producer can make improvement to quality by careful selection of breed and strain.