MINISTRY OF AGRICULTURE

DEPARTMENT OF ANIMAL HEALTH AND PRODUCTION

DAIRY FARMING HAND BOOK

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Foreword

Botswana is a net importer of dairy products from neighbouring countries. The government engaged consultants under NAMPAADD to come up with recommendations to enable Botswana to produce food for food security.

This therefore means Botswana should make efforts to foster dairy development plans wherever the potential exists. In so doing the gap between production and consumption of dairy products in the country will be narrowed.

Modernization of the dairy industry along the lines of large scale enterprises found in developed countries is the best strategy for assuring increased milk and dairy products. However this model may not be adaptable under our conditions. Rather consideration should be accorded to the peculiarity in our livestock production systems to determine how to modify and adopt the model in order to ensure its successful application under our condition.

This dairy handbook tries to identify some of the fundamental issues in a profitable dairy enterprise

Not all relevant information on dairying is contained in this handbook, but that the farmer should source more detailed information from elsewhere.

The Dairy Section – Ministry of Agriculture wish you enjoy reading this Dairy Handbook to better your dairy farm management and profitability in your dairy business enterprise.

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Introduction

Dairy farming needs a hard working, determined and patient person. The aspiring dairy farmer must know there are no holidays throughout the year. Dairy cattle have to be fed, watered, cleansed, their health monitored continuously and milked everyday at specified times. Milking intervals must be kept constant (adhered to).

A dairy farmer must have basic training in bookkeeping and keep records on the running of the dairy and artificial insemination (A.I.). Dairy cattle have to be loved and treated carefully for if a farmer treats them roughly, they will retain their milk, which will result in mastitis.

The dairy manager or farmer should have a very good working relationship with his farm workers. Where possible a dairy farmer should produce his/her own fodder because 75% of the farms income is spent on feed.

Unproductive cattle should be culled, as it would be costly to keep them on the farm. There should be constant supply of milk, therefore dairy cattle oestrus (heat) should be desynchronised and 75% of the herd should be in milk at any given time.

Milking machines must be serviced regularly to ensure efficient and effective operations failing which the cow's udder will be lost through inflammation of the udder given the high pressures. Strict hygiene should be kept at all times in the open cow sheds (kraals) in the milking parlour and the cows should be kept clean.

After milking the cows udder should be disinfected and kept standing for at least five (5) minutes to enable closure of the sphincter muscle in the teat canal.

When hand milking is practiced, milkers should always be clean and to wash hands thoroughly with soap before milking and after

using the toilets. Milkers should not have cuts on their hands and should not be suffering from any contagious disease.

Dairy cattle should be stall-fed and not to move distances grazing because the energy they use to move long distances grazing could be used for milk synthesis.

Dairy Breeds

The term dairy breed is used to differentiate those cattle that are bred primarily to produce milk against those that are used for meat production. Dairy cattle may be defined as a particular group of animals developed in a certain area for a definite purpose and having the same general characteristics such as colour, conformation and quality of product i.e. milk. A purebred dairy cow is one whose ancestry traces back to the same breed. A registered dairy cow is a purebred that has been registered by a particular breed association. There are six (6) major dairy breeds found in Botswana as follows: - Friesians/Holsteins, Jerseys, Guernseys, Dairy Swiss (Braunveih). Dairy cattle not common in Botswana are Aryshires, Dairy Shorthorn etc.

Holstein/Friesian Breed

Holstein/Friesian as it is commonly called. The Holstein/Friesian breed was originally developed in the Northern part of the Netherlands in the Province of Friesland and Northern Germany. The breed has long been known for its large body frame and high milk yield on average 20 – 25 litres/day, and butterfat content 3.5%. They are docile animals. Live weight 613kg. The colour pattern is varying proportions of black and white. There are occasionally red and white born from a black and white parents that carry the red factor as a recessive gene.

Picture of a Holstein/Fries land cow

The Jersey Breed

The Jersey breed was developed on the Island of Jersey the largest Channel Islands. Jerseys are very nervous and react quickly to both good and bad treatment.

Jerseys colour includes various shades of fawn either with or without white markings. The horns are inclined forward, are incurving small, at the base, refined medium length and tapered towards the tips. Heifers of this breed develop more rapidly than any other breed.

Jersey milk averages between 15 – 20 litres/day with butterfat content of 4.5%, which is rich in colour. Jerseys perform better under Botswana conditions than Friesians due to high ambient temperatures. Live weight of Jerseys is an average 386kg for a mature animal.

Picture of a Jersey cow

The Guernsey Breed

The breed originated in Channel Islands near the north coast of France. The Guernsey breeds are a shade of fawn with clearly defined white markings. The skin shows a yellow pigmentation.

The horns incline forward, are refined and medium in length and taper towards the tips. They are small and yellow at the base. The Guernsey's are alert but not easily excited.

Butterfat content averages 4.5% and is much yellow in colour than other breeds. The milk is also yellowish. On average a Guernsey produces 16 litre/day of milk. The Guernsey is a larger animal with a live weight of 459 kg. Its colour is yellowish and white with a white nose.

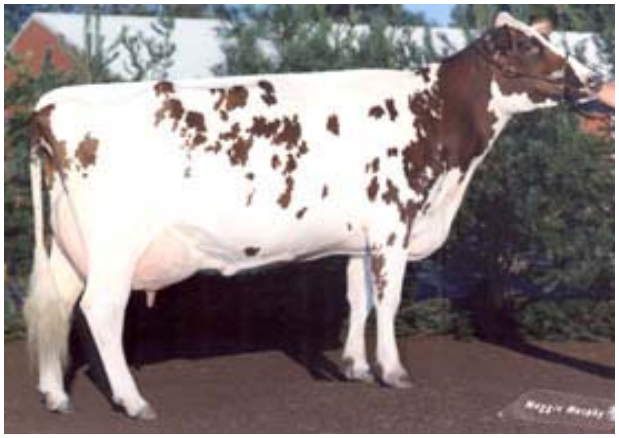
Picture of Guernsey cow

The Ayrshire Breed

The breed was developed in County Ayr in South Western Scotland hence the breed name comes from the county name. The breed was moulded under rugged conditions of the hilly county of the area. This breed is not common in Botswana but has been introduced by two dairy farmers in Pitsane. The breed of cattle is characterized by its red and white colour, shapely udders generally symmetry, balanced and smoothness of body. The red colour is characterised from cherry red to mahogany red which is different from the reds found in other breeds. The proportion of the two colours varies greatly.

The horns of the Ayrshire are long spreading and curved up at the ends. Some polled animals are found. Animals of their breed are quite nervous and sometimes hard to manage, keep good body conditions when kept under poor breeding conditions. The meat of the breed is characterised by white fat. Live weight is about 477 Kg for mature animals. Milk yield is on average 20 litres/day

Picture of Ayrshire cow



Dairy Shorthorn Breed:

The Dairy shorthorn is an English breed with a live weight of about 546 Kg. Their common colours are red or deep roan, although red and white are also found. The breed has a small head while the neck is thin towards the head rapidly thickening as it approaches the shoulder. Horns are short blunt and creamy. They do not have black tips and should curve with age inwards or upwards.

Picture of a Milking shorthorn Cow

DUAL PURPOSE DAIRY BREEDS

Dairy Swiss (Braunvieh) Breed:

The Dairy Swiss breed was bred in the rugged hills and valleys of Switzerland. The breed was developed over a period of many centuries. The Dairy Swiss was brought about through selection within the Brown Swiss, which was kept for three purposes milk, meat and draft.

The Dairy Swiss (Braunveigh) produces on average 18 - 20 litres/day of milk whilst the Brown Swiss produces 10 -15 litres/day. The Brown Swiss is common in Botswana and performs very well under our weather conditions provided they are managed well. Their colour varies from fawn to brown. The nose and tongue black and a light coloured bond extend around the nose. Spotting is seldom found and undesirable. Calves are light in colour at birth but darken with age.

Brown Swiss are rugged heavily muscled and lack the refinement of dairy cattle.

Picture of a Dairy Swiss (Braunveh) cow and Bull

Red Poll Breed:

Commonly found in Norfolk and Suffolk – United Kingdom. The breed has a deep red colour and no horns. Has a long head, short limbs with a heavy body. Live weight 556 Kg on average produces 19 litres/day milk. Not commonly found in Botswana.

(Picture of a Redpoll Cow/Bull)

The Pinzgauer Breed:

The bred originates from Austria. It was first imported into Republic of South Africa and South West Africa in 1902. The breed was bred under harsh conditions and extreme mountainous grazing caused the breed not only to be well known for its good ability to walk but also its high production potential even under difficult conditions.

Produces on average 15 – 18 litres milk/day. The basic colour varies from light red to very dark chestnut brown with a characteristic white that stretches from the withers along the top and bottom line as far as the brisket.

Picture of a Pinzgauer cow and Bull

Dairy Simmentaller:

Originates from Germany and was also bred over generations. Produces an average 10 –17 litres of milk a day under good management. It is a hardy animal and performs well under Botswana conditions. The colour is either yellow and white or red and white. It has a refined dairy conformation unlike a beef Simmental that is muscular and rectangular in conformation. The Dairy Simmentaller has a developed udder and is triangular in conformation.

Picture of Dairy Simmental cow and Bull

South Devon:

It is a dual-purpose animal with a live weight of about 713 kg and milk yield of 10 –15 litres/day.

Picture of South Devon Dairy cow and Bull

Dairy Farm Workforce:

A reliable workforce is essential to a successful dairy enterprise. Dairy farm labour is required in looking after the dairy cattle, cleaning the milking parlour and in production of fodder in the field. The farm labour force should be skilled in their undertakings, motivated, dedicated and as much as possible satisfied. Notwithstanding that the farmer should consider his needs first. If the main responsibility of the employee is milking he or she should be calm, reliable, sober minded, healthy and have a passion for animals. Training or re-training a farm worker is very important.

As and when you have determined your needs you do not necessarily employ someone who knocks at your door, but try to get the right skilled people. To get the right people you may need to advertise in a local newspaper. If the applicant for example claims to have done A.I. or can mix animal feed allow him/her to prove himself.

When you have decided to employ a person he/she should be told that work he/she is to perform. The new employee should be told her/his job description in front of the supervisor. Farmers should always send their workers for training courses arranged by dairy extension officers from the Ministry of Agriculture. If the farm workers know how to perform their duties they will need less supervision and hence the farmer will have more time to manage his/her farm.

In fodder production, there is need in planning to choose a sequence of crops which give an even spread of labour during the growing season. Where labour is employed solely on the dairy unit, it is possible for one man to cope with the every day tasks:- milking, feeding, dung disposal – of running a 50 cow unit. As the

herd becomes larger so do the tasks of marshalling groups of cows, breeding management and group feeding take a greater proportion of time. If the dairy unit is to be profitable, these tasks must not be skipped. Where the dairy unit is on a large farm, the provision of grass, grass conservation and supply of fodder crops tends to be the responsibility of the arable specialists. The arable specialist should appreciate the importance of producing good quality fodder on the farm and how important their efforts are in securing these quality end products.

Reproductive Cycle

A dairy farmer should aim to have a cow calve every year. If a cow fails to calve every year losses due to decreased or no milk during the longer calving intervals from the culling of infertile cows and from lack of herd replacement. Reasons for low fertility are:

i. Anatomical or physiological malfunctioning of the cow.
ii. Reproductive diseases.
iii. Failure of correct heat detection and other failures in reproductive management.
iv. Infertility and malfunctioning of the bull.

Modern dairy farmers use artificial insemination (AI) to breed their cows. Semen from bull studs or imported semen are usually genetically superior and disease free.

Heat detection is essential if artificial insemination (AI) is to be carried out. Spotting a cow standing to be mounted is the crucial sign to look out for as it is the most useful indicator to use to decide when to serve a cow.

Cows generally show heat signs by being receptive to a bull or A.I. every 21 days. A cow's oestrus cycle can range from 12 – 30 days. Heat behaviour lasts for two to three days as follows:-

i. Aggressive bunting and rubbing by pairs of cows.
ii. Sniffing around the tail head.
iii. Chin resting.
iv. Orientation as if to mount.
v. Disorientation mounting without standing.

vi. Licking.
vii. Disorientated mounting.
viii. Standing to be mounted (the key sign)

A cow on heat should give you a sign of standing to be mounted. She will stand firmly, no signs of hostility nor aggression nor escape from the mounting cow. Occasionally she will mount another cow head to head. A cow on heat stands around longer, walks more, eats less and milk yield drops but picks up the next day. Additional signs for a cow on heat are:-

i. The cow's vulva appears moist, red and more swollen than usual and secrets clear mucus.

ii. The cow is restless and does not lie down cuddling.

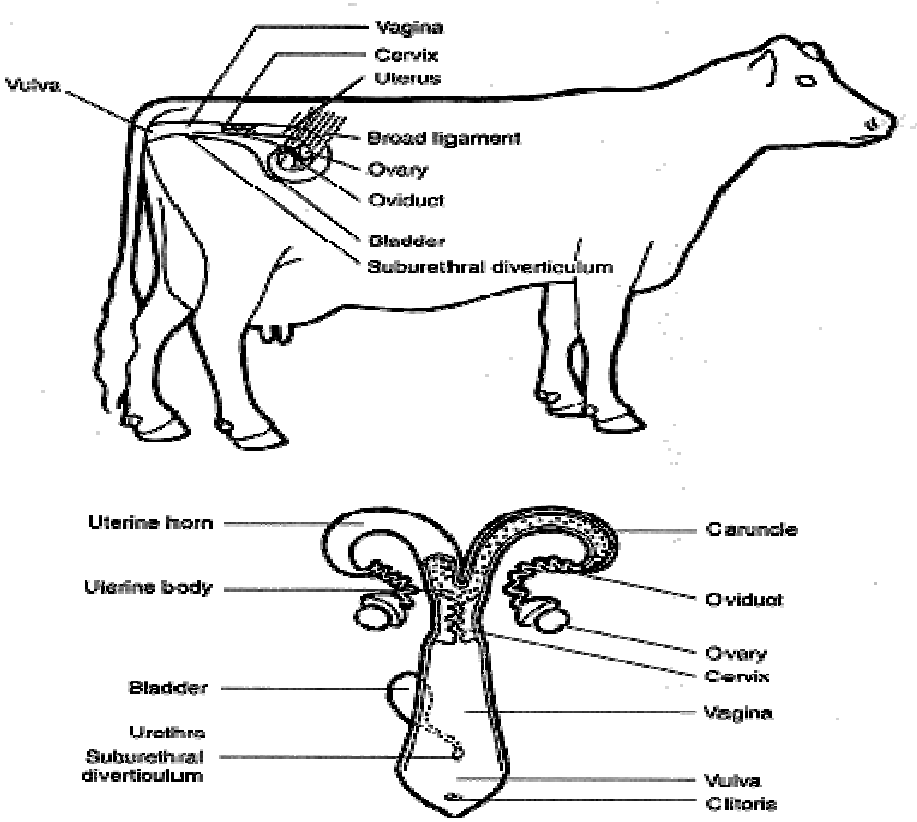
iii. The cow encourages others to mount her by looking around at them and raising her tail known as soliciting.

To time insemination accurately, it is important to know when the follicle will ovulate and release the egg from the ovary into the oviduct. Normally a cow ovulates 24 to 30 hours after she first stands to be mounted. A cow normally remains on standing heat for about 12 to 15 hours. For the average cow, ovulation occurs 10 - 16 hours after it goes out of heat. It is important to inseminate a cow at least 8 - 10 hours before ovulation because it takes time for the sperm to reach the oviducts and also to undergo the essential process of activation which takes six to eight hours which is technically called capacitating fertility.

Guidelines for timing insemination are as follows: -

i. A cow seen on heat before 6am - inseminate today
ii. A cow seen on heat after 6am - inseminate tomorrow.

Diagram of a cows reproductive system



Advantages of A.I. are the following:

i. It is the only form of mating that allows efficient control of venereal diseases.

ii. It is the most economical method of mating which can be applied. It eliminates purchase of expensive bulls and maintenance costs and prevents possible losses of bulls.

iii. It is the most efficient technique of cattle improvement. One bull can procreate 500 to 8000 progeny per annum while natural servicing provides a mere 30 to 40 progeny per annum.

iv. Adequate progeny is procreated for a reliable evaluation to be made of the breeding value of a bull at a relatively young age.

v. It necessitates accurate record-holding and a high level of management, resulting in a high degree of efficiency.

vi. Proven bulls are seldom sold, and their frozen semen can be distributed world-wide.

vii. The semen of outstanding bulls can be stored for years and thus used for subsequent breeding programmes.

Disadvantages to A.I. are as follows:

i. Venereal diseases can be distributed rapidly as a result of incorrect or negligent handling with A.I. because more cows are involved.

ii. Undesirable characteristics and heritable deficiencies are transferred to more progeny and

iii. The possibility of in-breeding is much greater than with natural servicing.

Bull Management

When selecting dairy cattle to be used for certain mating in a breeding program a breeder usually rates a bull on the basis of milk production of the dam of the bull type and pedigree. In determining the overall value of the animal the importance attached to each trait depends on the breeders experience and what he is trying to accomplish. The only accurate method of identifying superior bulls is by progeny testing. When purchasing a dairy bull the rating of its progeny is evaluated based on;-

i. Milk yield litres
ii. Butterfat %
iii. Protein %

For 305 days lactation period. The production record for daughters of the bull being used is compared with production record of daughters of other bulls within the same herd and within the same year. The bulls pedigree “parentage of the bull”, should also be considered when selecting a bull. The bulls parentage i.e. dam should be known to calve with ease and to be resistant to diseases such as mastitis. Only proven bulls should be used by a dairy farmer.

Bulls should be handled with care from the calf hood until they reach maturity. A bull should be dehorned as bulls can be dangerous.. The bull should be exercised regularly to keep it in shape. A young bull can only be used to serve from 18 months old. Mating should be increased gradually to three times a week because more than this can exhaust and shorten the reproductive life of a bull. A bull should be kept in its own paddock and lead to female cows for maturing only during a planned period.

Bulls that are allowed to roam with the female cows is that cows on heat are served without the farmer’s knowledge. Notwithstanding that, record keeping becomes virtually impossible. In breeding is bound to take place if proper management is not done. The bull is likely to serve young heifers that are not fully developed.

The disadvantage of using bulls is that sterility goes undetected as the bull could be seen servicing cows yet no calves at the end of the year. Wasted time as no cows conceive. If the bull was not selected properly the progeny would be of poor quality. To avoid inbreeding bulls have to be changed every to (2) years, and are very expensive. Heavy bulls should not be allowed to service young heifers for fear of injury. Bulls infected with the reproductive disease spread the disease quickly.

Bulls are still used by majority of dairy farmers in Botswana because the bull will never miss a cow on heat. Dairy farmers should use artificial insemination (A.I.) as it is advantageous and cheaper so long as the farmer can master the technique, detect heat in time, keep proper records and manage his herd well.

Calves Rearing

Some of the major reasons for mortalities in very young calves are disorders of the intestinal tract and the respiratory tract. The casual organisms responsible for these conditions are pathogens (organisms causing disease) bacteria and viruses. Such mortalities can largely be prevented through natural immunisation of the calves by consumption of colostrum.

The offspring of cattle and other livestock gain immunity through ingestion of the first mothers milk immediately after birth. The antibodies are taken orally and are transmitted from the calves' digestive tract to its bloodstream via the lymphatic vessels. This transmission of the immunoglobulin takes place through the intestinal wall and is closely related to the prevailing acidity.

Composition of Colostrum

The composition of colostrum (milk during the first 24 hours after calving) makes it clear that it is a more concentrated liquid than whole milk. The extra protein in colostrums is Gama globulin which is the antibodies. Colostrum also contains nearly double micro and macro minerals contained in whole milk. It is a richer source of all vitamins particularly vitamin A and E and many of the B group. In addition colostrum contains a variety of cell like components some of which promote passive immunity i.e. macrophages. Colostrums therefore has an antibiotic effect.

Although colostrum has a mild laxative effect with the initial function of setting the calves digestive tract in motion, it only leads to looser faeces if it is fed to older calves. It does not course diarrhoea, colostrum must never be thrown away as this would be

a waste of calf feed. It can be frozen in small quantities and stored for six month without getting spoiled.

Substitute for Colostrum

If colostrums is not available the following procedure can be followed to keep the calf alive (i) one beaten egg in 300 ml water mixed with the one (1) teaspoon caster-oil and 600ml whole milk. The mixtures must be fed to the calves at body temperature 39ºc. A farmer should always ensure that the calf gets colostrum within six (6) hours and enough thereof, within 22 hours of birth. Cows with big udders are often milked shortly before calving. If stripping is carried out intensively for 3-9 days before calving such cows will normally have little or no colostrums at calving. Calves therefore would receive fewer or no antibodies.

For the first four (4) days a calf should receive colostrum. When remove from their dams within 24 to 48 hours they are fed 2 litres milk in the morning and 2 litres milk in the afternoon (evening).

Care of the calf from day 4 to weaning

Whole milk or milk substitute (milk replacer) should be fed to claves until they are 5-8 weeks old. During that time before the calf is weaned, each calf should receive 2 litres of milk in the morning and 2 litres in the afternoon and 2 litres in the evening. Weaning in dairying means stopping to feed milk to a dairy calf.

It has been stated that fresh milk or milk substitute should be fed to a calf according to specification. The feeding of both fresh whole milk and milk substitutes to calves has both advantages and disadvantages. The main disadvantage of feeding a calf whole milk is that the 6 litres fed to a calf per day could be sold and thus increase a farmer's income.

Whilst high quality milk substitute contains a large proportion of milk products, the temperatures of the re-constituted milk substitute is very important. The temperature of the reconstituted milk should be around 39ºc. If the temperatures are not maintained according to specifications calf intestinal disorders is a probability and or diarrhoea. Calves normally start eating dry starter mix when they are a week old. To teach them to start

eating some small amount of the mix should be rubbed onto their mouths or a small quantity of the mix could be dropped in their milk feeding buckets.

As calves normally start eating when they are a week old, good quality hay could be introduced to them.

The feeding of good quality leguminous crops, Lucerne and or *Dolichos Lablab* stimulates rumen development. Drinking water should always be available.

Care of the Dairy Calf from Weaning to 3 Months

After calves have been weaned at 5 or 8 weeks old, calves can be fed a maximum of 3 kilograms of calf starter a day and good quality hay should be available ad-lib to stimulate rumen development. Milk ration can be reduced correspondingly, this eliminating growth breaks.

Housing of Calves

The calf box should be light, dry and draft free and if possible separated from the cowshed in order to diminish the risk of infection.

During the colostrums period i.e. 4-5 days, the calves are preferably kept in littered single boxes which should be a minimum of 120cm long and 90cm wide. The single box has its undeniable advantage for the colostrum period. Only here the calves can be individually taken care of during this important start phase.

However farmers become more and more aware of the fact that, from the second week of life calves are by far suitably kept in group boxes. The recommendations of the new calf keeping regulation point in this direction.

The Advantages of Group Keeping

The calves can move freely. Skeleton musculature and vitality are strengthened. The animals have social contact and young calves learn from older calves e.g. intake of concentrates and hay. The utilization of feed is improved. It is strongly advised to keep the calves on straw, especially from 2 to 4-5 weeks of age. If animals are kept on straw cleanliness through regular changing of straws should be maintained.

Drinking and feeding space should be made available for all calves.

When bucket feeding, the natural sucking instinct of the calve is reduced by half. To ensure that the calves do not suck each other, they have to stay longer behind the catcher grating which affects the working routine.

Computer Controlled Feeding

(Feed the calves optimally). Each calf has a transponder. When a calf enters the feeding box, the calf is recognized and a present milk ration is fed.

A computer the brain of a plant supplies the calf with the allocated ration and ensures the calf receives its milk in small portions over the day. In addition it reports calves which have not taken or only partly taken their rations. The feeder prepares the ration for each calf and is:-

- always fresh and in correct quality
- always in correct concentration
- always at optimum temperature
- and in all variations; as powder drinks, as liquid milk drinks or mixture of both

Additional Advantages

i) Feed costs saved due to accurate rationing of milk, concentrates and hay.

ii) Satisfy the natural sucking instinct of the calves. The problem of calves suckling each other is minimized.

iii) No mixing of milk by personnel, no carrying of buckets, no scheduled feeding jobs.

iv) Feeders can easily be built into old buildings, or in the open ground plan design.

v) No catcher granting, reduced feeding space.

Rearing of Dairy Heifers

A heifer is defined as any female calf up to her second calving. Dairy replacement heifers are usually separated from their mothers (dams) within two days of birth and managed to achieve specific growth rates throughout the rearing period until calving at the planned age, weight and body condition.

The progressive dairy farmer of today realises more and more that heifers have to receive the correct type and amount of feed if a high quality dairy cow is to be produced at a relatively early stage. One can only hope that the practice of leaving weaned heifers in the veld until near the end of gestation period is something of the past.

The progress of the herd depends largely on the way in which heifers are raised for replacement purposes. A sound herd cannot be establishment by the continual purchased of new heifers of whose history not much is known. The costs are relatively low when compared with prices at which heifers are sold.

The best way in which the dairy farmer can determine the efficiency of his managerial programme is by measuring the performance of his heifers in accordance with accepted standards.

Rearing replacement heifers has not always been seen as a fundamental part of the dairying enterprise but, when correctly planned and when specific feeding programmes have been used overall improvement in herd longevity and farm profitability results. Feeding and managing replacement heifers must be given as much priority as dealing with the milking cow. Rearing heifers must be seen as an investment in tomorrows profit generators.

They represent the highest genetic potential in the herd, so the opportunity for continued productivity should not be wasted.

Objectives of Rearing Heifers

The ultimate aim of dairy heifer rearing is to produce well developed heifers able to express full yield potential at the desired calving age, with minimum costs, losses and health problems, and with the potential to milk for at least 6 lactations.

Rearing replacement heifers allows for: -

-Replacement of culled cows
-Increase in herd size
-Introduction of new blood lines
-Increase of genetic base
-Improvement of disease control

Age for Bulling

The age for bulling depends upon the breed and also upon the requirement of the desired calving pattern. Certainly the smaller breeds tend to become mature earlier than the larger breeds but this has to be correlated to the practical demands of the annual milk production cycle.

It is generally suggested that heifers should not calve before twenty three (23) months old but should calve as soon as possible after that age.

A Basic Ration for Bulling Heifers

For small framed animals like jerseys
-3.4kg hay (or hay equivalent in silage)
-1.0-2.5 concentrate
-plus straw

For large framed animals like Friesian/Holsteins

-7kg of hay (or hay equivalent in silage)
1.0-2.5kg of concentrate
-plus straw

Water should be always be available.

Heifers require both protein and energy for optimal growth. After the feed in take and daily requirements of the heifer have been calculated accordingly, the producer should ensure that all the necessary nutrients are present in the right proportions. This is what is meant by a balanced ration.

With improved feeding and management practices, heifers often develop too big body mass before being serviced for the first time. This frequently leads to reduce fertility and is caused by selection of heifers for the first service on the basis of body mass rather than age. It therefore seems evident that overfeeding and late breeding will lead to inefficient reproduction. The age of the heifer at first calving apparently has no influence on calving problems.

Gestation will increase the feed requirements of heifers particularly during the last two or three months of the gestation period.

Heifers should not be allowed to become too fat. Fat deposits in the udder may infer with the development of the milk gland tissues and this may result in reduced milk production after calving.

Minerals and vitamins supplements should not be left out of consideration. The two most important minerals affecting fertility are phosphorous and cobalt. Phosphate supplements can be given in the form of dicalcium phosphate as a lick or by including it in the concentrate mixtures.

Vitamin A deficiencies in heifers can lead to abortions, prenatal death of foetus, weak calves at birth and retentions of the afterbirth. Good quality hay, green pastures and yellow maize will be sufficient to satisfy vitamin A requirements of the heifer.

The vitamin content of a feed can nevertheless be reduced by climate, heat or storage.

Too early breeding at an immature stage may lead to the restriction of growth as a result of the additional nutrients requirements for gestation. A further disadvantage of too early breeding is the incomplete development of the skeleton which may lead to calving problems. Furthermore, the lactation following on a too early calving may have very detrimental effect on the growth of heifers.

Feeding the In-Calf Heifers: entails steady increase in condition from the relative learners of the bulling heifer to the well-conditioned down calver. From the fifth month of pregnancy onwards, the demands of the developing foetus and udder rapidly increase. In good grazing this demand on bodily reserves is usually adequately met from grazing.

Where the bulk feed is not good enough quality, then it may be necessary to feed some concentrates to ensure that the heifers attain their target calving weight. When in-calf heifers are out on grass and sufficient grass is available this should be sufficient to maintain the required growth rate. If the grass becomes scarce then immediate steps should be taken to supplement the ration so that the animals continue to gain weight as required. Animals must be brought to calving in a fit but not fat condition.

Feeding First Lactators: Heifers in their first lactation are still Growing animals and it is important to ensure that feeding management is good. They must be able to milk, gain in weight, Conceive successfully and remain as productive members of the herd for 6 or more lactations.

Milking heifers feed in competition with cows are likely to produce less milk in their lactation, thus having a higher chance of being culled before calving for a second time. However since it is not often practical to feed heifers separately, it becomes important to ensure that they are well grown prior to calving. One way to reduce the effect of competition is to allow easy access to silage by ensuring adequate trough space. Regular observation of

farmer is also important to help ensure that the heifers maintain adequate feed intake. Notwithstanding that more research work is needed to identify the precise nature of diets recommended for heifers throughout the rearing period.

Factors Influencing Milk Production In Lactating Cows

The heritability of milk production is around 30% i.e. one third, whilst 70% i.e. two thirds is attributed to environment. The extend to which the genetic production potential depends on the ability of the dairy farmer to control environment factors to the advantage of the cow by creating a conducive environment for a cow to reach its potential.

Stage of Lactation: After calving milk production usually rises rapidly until the peak is reached 30 to 60 days later. The production peak reached influences the total production considerably. The period before peak production is usually longer with highly productive cows. Once the peak has been reached, production gradually starts to decrease at about 5% to 6% per month if the cow is not pregnant. When a cow is five months pregnant the tempo of milk reduction starts to increase. Heifers that are first calvers the tempo of decrease after peak production is 3% to 4% per month.

Feeding: For optimal milk production the ration must contain sufficient energy, protein, crude fibre vitamins and minerals cows produce approximately half of their total milk yield during the first 100 days of lactation. For this reason it is essential to feed cows properly during the early days of lactation.

Feed intake is poor at the beginning of lactation but improves as lactation increases. As feed intake is not proportional with milk production requirements the cow possess the unique ability to utilize her body reserves for milk production.

The lactating cow usually losses weight at the beginning of lactation as a result of withdrawal of her body reserves until a point when she reaches her peak. Cows can even under good feeding conditions lose as much as 66kg in body mass during the

first three months of lactation. From 120 days after calving the body mass gradually increases until calving.

In order to exploit the potential milk production of a cow the feeding of a dairy cow should be divided into four stages as follows: -

(a) Feeding stage before calving

(b) Feeding stage during early lactation (0-100 days after calving). At the beginning of lactation the dairy cow does not have the appetite or the capacity to take in sufficient forage according to her feeding requirements and it is therefore essential that feeding concentration of dry material be considerably increased during this period, while poor quality roughage is undesirable. As already mentioned body reserves are now utilized for milk production. If a highly production cow does not have sufficient body reserves she will not reach her production peak, consequently milk production will be adversely affected.

(c) Feeding stage during mid lactation (100 to 240 days after calving). If a cow is not fed well during early lactation, maximum production will not be obtained by feeding them extremely well during mid lactation. Sharp increase in feeding in mid lactation will result in an increase in body mass (fattening) rather than in an increase in production especially in poor productive cows. High quality hay should be fed during this period

As a result of good feeding during early lactation extra milk can be produced during mid lactation at relatively little expense.

(d) Feeding stage during late lactation 241-300 days after calving. Late lactation must be regarded as a period of recovery and preparation for the next early lactation research results indicate that body reserves are accumulated more effectively during this period than during the dry period.

Age: Milk production rises slowly up to age of eight years, depending on the breed and reduces fast. Mature cattle produce about 25% more milk than two years old heifers. Heifers must be inseminated at such a time that they calve when 24 months of age or earlier.

Size of Cow: Longer cows generally produce more milk than small cows but milk yield is not related to body mass.

Breed: Milk production is partly a hereditary characteristic. This explains the different breeds as indicated below: -

BREED	MILK PRODUCTION	BUTTERFAT	
	Milk/kg	%	kg
Ayrshire	3,475	3.79	132
Dairy Swiss	3,506	3.59	126
Guernsey	3,980	3.59	143
Friesian	3,379	4.25	144
Jersey	3,052	4.73	144
Dairy Shorthorn	3,271	3.71	121

Number of Milking/Day: Cows milked twice a day at intervals of 10 hours and 14 hours or 8 hours and 16 hours produce approximately the same amount of milk as those milked at intervals of 12 hours. Three milking per day increases production by 10-25% and four milking further increase of 5 to 15%.

Oestrus: When oestrus occurs milk yield may temporarily decrease for a day or two but is negligible.

Dry Period: A dry period of 60 days between lactation is essential
for fair milk production during the ensuring lactation.

Climate: Milk production drops when the environmental temperature rises to 28ºc of 30ºc. This is due to a drop in feed intake in an attempt to prevent over heating. Heat stress influences high milk producers more than low milk producers and are especially harmful during peak production. Small breeds are more resistant to heat stress than large breeds. An increase in

temperature is more harmful than a drop. The provision of shade e.g. planting trees or shade nettings cannot be over emphasized.

Exercise: Moderate exercise for dairy cattle promotes production highly. Cows on grazing use 50 to 100% more energy for maintenance than cows in non- grazing system (zero grazing).

Diseases: Diseases such as mastitis, ketosis, milk fever and digestive disturbances can cause a decrease in production. The occurrence of such-clinical mastitis causes 10% decrease in production.

Management: High producing cows are usually highly strung and excitement causes a decrease in milk production. Good supervision before and during milking is absolutely essential for optimal production. Cows should never be driven to the milking parlour quickly. Regularity should be maintained in milking and feeding times. Care should be taken that the cows are milked dry. Incomplete milking occurs when the milkers are inefficient, when the milking machine hurts the cow, and this can cause mastitis through inflammation.

Dairy Nutrition: (Feeding Dairy Cattle)

Dairy cattle use feed for the following purpose: -

i) Maintenance
ii) Growth
iii) Milk Production
iv) Pregnancy

Maintenance: Maintenance is the sum of those needs for food for keeping the body functioning properly, replacing worm-out tissues, maintaining body temperature, and supplying energy for muscular activity. When the maintenance requirements of a non-pregnant, non-lactating animal are met exactly, the body stores of protein, fat and mineral matter are held constant. Approximately one half of the feed consumed by a lactating cow is used for this purpose. The maintenance requirements of a cow are roughly proportional to body size. Cows are individuals, and may vary.

Growth: Growth requirements, which are need for increase in body size, can be met only after maintenance needs have been satisfied. Growth requirements vary with age, breed, sex and stage of development. In relation to body weight, young animals have much higher requirements than mature animals for protein, energy, vitamins and minerals. Also young animals suffer earlier and more severely from nutritional deficiencies.

Milking Production: These requirements depend on both the amount of milk that a cow is producing and the butterfat content of milk. A cow which produces 20 litres of milk daily requires twice as much protein and energy above her maintenance requirements as the cow producing 10 litres contain the same butterfat content. If the nutrient requirements for milk production are not met, the cow will draw on her body reserves when the reserves have been used up production will drop to the amount that can be produced from the nutrients that she receives in excess of maintenance.

Pregnancy: Pregnancy requirements are relatively low, but they should not be ignored. Pregnant cows should be fed adequate amounts of all nutrients. During the last two months before parturition, the recommended energy allowance for the pregnant heifer is 50% to 60% higher than for a non-pregnant heifer of the same size.

Feed Nutrients: The nutrients of feeds are classified into water, carbohydrates, protein, fat, minerals and vitamins.

Water: Is a constituent of all body tissues and fluids. A large amount of water is needed for the digestive process. Water also helps to carry nutrients to the various parts of the body, to control the temperature of the body and to remove waste products. The body of a mature cow contains 70% water and milk contains 87% water.

Proteins: Protein is a part of a feed which contains nitrogen. Protein is essential for growth, tissue repair and milk production. Because milk is rich in protein, high producing cows need relatively large amounts of this nutrients.

Fat: The principal value of fat in the ration is that is it a more concentrated source of energy than carbohydrates or protein. Most feed rations meet the requirement.

Minerals: Minerals are needed for the skeletal growth and normal body functioning. Those elements which are needed in relatively larger quantities such as calcium, phosphorus, magnesium, sodium chlorine etc. are called the macro elements or major elements. Those that are needed on relatively small quantities such as iron, copper manganese, zinc and cobalt are known as the micro elements, minor elements or trace minerals.

Vitamins: Vitamins are also needed by dairy cattle. Vitamin supplementation is of great importance. Vitamin A, Vitamin D, Vitamin B complex, Vitamin C, Vitamin E, and Vitamin K.

CHARACTERISTICS OF FEEDS

Concentrates: The term concentrate refers to that group of feeds which are relatively high in total digestible nutrients and low in crude fibre. Feeds falling in this group of feeds are the cereals, grains and their by products. The term concentrate is used because the nutrients are in a concentrated form as compared to those in the forage crops.

Forages: Forages refers to those plants which are feed to livestock in the form of hay, silage or pasture. Forages generally are lower in total digestible nutrients and much higher in crude fibre than the concentrates. Forages are divided into legumes and grasses. Legumes are those plants which have nodules on their roots. Legumes generally have higher protein and minerals than the grasses.

Characteristics of a ration: There are several characteristics of a feed or ration that affect its consumption and utilization. Among these are palatability variety, bulk and laxativeness. Both forages and concentrate should be palatable. If forages are not palatable cows will eat less of it and larger quantities of concentrates. Corn stover, late cut hay and spoiled silage are not palatable. Corn silage, early cut hay, Lucerne hay

and well kept hay crop silage of quality is palatable and will be eaten by cows.

It is usually easy to provide a palatable concentrate mixture for dairy cattle. Dairy cows enjoy common grains and its by products concentrated. Feeds such as linseed oil meal, cottonseed cake, molasses, bran etc improve the palatability of a concentrate mixture.

Greater variety frequently improves the ration nutritive value and the amount that the animals will consume. A combination of hay and silage frequently results in greater dry matter consumption than either one feed as the sole forage. A combination of several concentrates is often more palatable than a simple mixture. If cows eat normal amounts of forage bulkiness of the concentrate mixture is not a problem. Bulkiness of the concentrates mixture is desirable however the ration must also contain some forage. Laxative feeds are desirable. Feeds such as linseed cake molasses etc counteract the constipation nature of mature hay, corn stover and straw. Liberal amounts of legume hay and good silage will produce the desired laxative effect in a balanced ration.

DRY COWS MANAGEMENT

A dry period of approximately 60 days between lactation is essential for fair milk production in the ensuing lactation. In short the dry period is the time from the end of lactation until the cow calves again. Many farmers have a tendency to neglect their cows during the dry period.

During the dry period the cows udder gets the opportunity to recover after the 305 days of the lactation period. This is essential because if the cow is not allowed this rest period the next lactation could result in a loss of at least 30% in milk production. It is estimated that the calf (foetus) gains 60% of its birth weight during the last six (6) weeks before calving. This therefore means that the cow should be well fed during this critical growth phase for the foetus. The feed conversion of a dry cow is less effective than that of a lactating cow. When a cow is milking the cows mineral reserves are depleted and cannot be stored unlike energy

reserves. The cows mineral reserves can only be replenish when the cow is dry.

The cow should be dried off 224 days from the last service even if she is producing milk well. This can only be monitored when records are kept.

Concentrates fed to drying cow should be stopped followed by stopping milking. At the time a cow is dried up the farmer should administer dry cow therapy by injecting a syringe of dry cow treatment into each quarter followed by teat dip. After the cow is dried off she should be watched closely for a week at least for signs of mastitis i.e. red and swollen teats.

FEEDING A DRY COW

Dry cows need nutritious food for growth of the foetus and the replenishment of her body reserves. Dry cows should be fed the same feed as lactating cows i.e. roughage of good quality. Dry cows should not be fed concentrates. Good roughage fed to dry cows should be supplemented with only minerals.

Dry cows should not be fed Lucerne hay because it contains high levels of calcium. To high concentration of calcium in the cows body can cause her to suffer from milk fever after calving.

When a cow is about to calve she should be moved to the quieter place with no disturbance. The cows appetite at this stage is depressed and should not be fed concentrates. Concentrates should be fed from the day of calving and increase at the rate of kilogram until the desired maximum is reached. This feeding strategy allows the microbes in the rumen to adjust to the change in the cows diet.

MILK SECRETION

Milk production is a process of synthesis which under normal conditions occurs continually by the lactation in the alveoli of the udder of the mammal.

Milk which is the product of this synthesis process has a composition which varies considerably in the case of different

mammals. The cows udder is formed from four mammary glands. The udder should be reasonably large, posses a level floor and be neatly attached both front and rear. The teats should be squarely placed, hang perpendicularly and be of good size. Defective udders may be pendulous or pear shaped, cut up between the quarters or halves or may lack one or more quarters. The teats may be short and or hard to milk.

The udder is composed of two principal types of tissue, secreting and connective. A limited amount of connective tissue is necessary for support of the glands. The desirable udder is one which contains a minimum amount of connective and fatty tissue and a maximum amount of secretary tissue. It shrinks away to nothing after milking and upon massage feels soft and pliable without the presence of lumps or knots. Fibrous growth may be caused by bruises or mastitis. Sometimes entire quarters become diseased and fail to secrete milk.

Milk is formed in the epithelium cells of the alveoli and deposited in the alveoli lumen where it is stored between milkings. A certain amount of the milk also flows from the alveoli and gathers in the udder tubes. In order to prevent all the milk from following out of the alveoli to the lower parts of the udder, there are constrictions and pleats in the tube system keeping the milk back. About 40% of the available milk is stored in the udder, teat cisterns and large tubes of the udder, while 60% is kept in the small tubes and alveoli lumen.

In order to recover the available milk, the cooperation of the cow is essential and it is therefore of great importance that the mechanism of the process of milk letting be thoroughly understood.

When the udder is stimulated by the regular routine of mastitis test, washing and drying, the stimulation message is sent to the brain the stimulus goes to the hypophysis (a gland situated underneath the brain). The hypophysis secretes the hormone oxytocin into the blood.

The oxytocin is carried in the blood through the heart to the udder where it stimulates the fine muscle fibres (myo-epithelium cells)

on the outside of each alveolus to contract. This contraction causes the milk to be forced out of the alveoli.

Consequently the milk flows down into the tube system where it is recovered by the milking process. A period of about one minute expires from the induction of stimulation to the contraction of the alveoli.

If the milking machine is attached without any effective stimulation only, the little milk which is present in the teat and udder cisterns is recovered (milked out.) The sucking and pressing action of the milking machine may also have a stimulation effect on the hypothesis which expedites oxytocin secretion. However after the first milk has been removed within 10 to 15 seconds, the vacuum and pressure on the empty teat cause pain or irritation which causes the cow to keep back her milk.

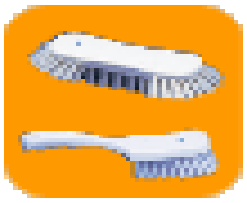
Should a cow experience pain first before milking, be frightened and or be restless the hormone adrenaline is secreted by the adrenal glands and nerve ends. Adrenaline is also carried in the blood through the heart to the udder where it narrows the fine veins which should transport the oxytocin to the alveoli. This narrows the small veins causing the oxytocin not to reach the alveoli and consequently the contraction of the alveoli is prevented.

If a cow has been frightened before milking and does not want to let her milk flow, she must be allowed to rest for 15 to 20 minutes during this period the adrenaline will disappear.

Contact stimulation such as massage encourage teat action, the washing and rubbing of the udder for at least 20 seconds and the drying of the udder with disposable paper towels stimulates the necessary oxytocin secretion. Some cows react to secondary stimulation such as noise made by the vacuum pump, milking machines or the smell of concentrates fed during milking.

Some cows milk even flows from the teats before stimulation through contact is undesirable as the oxytocin is wasted before milking. Cows should be used to regular routine of contact stimulation only.

It is also of great importance that milking machines not to be attached to the teats to long after stimulation because the optimal action of the oxytocin has duration of about 5 minutes after which it decreases gradually.



CLEAN MILK PRODUCTION

The producer must first of all ensure that his animals are free from diseases and are in a health condition. Any cow showing or suspected of ill heath should at once be isolated from the heard, and its milk should never be mixed with the general supply. This milk should never be fed to calves unless it has previously been boiled.

The condition of the milking parlour or milking shed should receive special attention. A good well-constructed milking parlour is an undoubted inducement towards the production of clean milk. When a milking parlour is easily cleaned, well lighted and ventilated, and has a good and sufficient water supply, less labour is required and the milkers take more care and interest in their work.

It is necessary to consider the cleaning of the animals and other measures essential in the milking parlour for clean milk production. It is also necessary to clean out the milking parlour or milking shed prior to milking. Particles of manure should be removed from the flanks and tail of the animals.

THE MILKING PARLOUR

Should be used for milk production only and not for tools or any other articles. When bottled milk is sold from the farm directly the milking parlour should have at least two separate rooms, one for handling the milk and the other for washing utensils. The milk bottling room should have a concrete floor with ceramic tiles, smooth walls with tiles, ceiling and kept strictly clean.

Fly control: There are two major reasons for fly control:-

(i) Flies may annoy to an extent that milk production is decreased.
(ii) Flies are a source of large numbers of very undesirable bacteria. Flies breed rapidly in filthy conditions

It is therefore obvious that all important steps in fly control is to practice sanitation in the dairy farm and milking parlour. Manure to be removed daily to the fields. Milking parlour should be screened. Waste disposal containers should be kept covered and cleaned after emptying.

THE HEALTH OF A COW

All cows should be in good physical condition. Good herd management demands that the dairy herd be kept free from diseases. Studies have shown that the monetary profits from diseased herds are decreased from 15% to 25%. Dairy cows should be tested every year for TB and Brucellosis and kept free of such common diseases. The herd should also be kept free and tested regularly for such diseases such as mastitis. Before dairy cattle are bought they should be tested and found free of these diseases.

Dairy cattle should be kept free of venereal diseases such as vibriosis, trichomoniasis and infectious pustular vulvo-vaginitis (IPV) can cause havoc in the herd. As a herd problem these diseases seem to be most important in that they increase the number of services per conception and thereby lowering the breeding efficiency. New animals to be purchased should be certified free from these diseases or should be segregated and tested before being mixed with the herd. By means of A.I. most venereal diseases can be effectively controlled and eradicated.

Non-infectious or functional infertility includes congenital as well as acquired physiological aberrations which lead to infertility or reduced fertility.

Congenital Conditions: This includes hereditary defects like hypoplosia (under-development) of the sex organs.

Acquired Functional Infertility: This condition which often occurs in over-fed cows and heifers which are serviced to late, may be prevented by good managerial practices.

Deficiencies: The role of mineral, trace elements and vitamins deficiencies and malnutrition in functional and even infectious infertility is often underestimated.

Anoestrus (absences of oestrus as a result of a phosphate or vitamin A deficiency and poor conception figures with a copper deficiency are some of the more well known examples of this role.

MACHINE MILKING

The interest which has been taken by many farmers in clean milk production and prevalent shortage of labour has led to a more general use of milking machines. The difficulty experienced in obtaining skilled milkers is one which most likely to increase than to decrease. Farmers have naturally been seeking some way of overcoming this obstacle and those who are keen on clean milk production are consequently installing milking machines. Apart from assistance afforded in the production of clean milk, there is also reasonable ground for contending that the uniformity of mechanical milking results in a higher milk yield, but it must be pointed out that no mechanical milking can be absolutely uniform unless positive control is fitted to ensure that the pulsations on every unit operate regularly and at the same speed. It should also be noted that whilst machine milking enhances clean milk production, nothing can contaminate milk more quickly than an improperly cared for milking machine. Two definite advantages of machine milking are:-

(i) Cleanliness of the milk
(ii) Saving of production costs.

(i) **Cleanliness of Milk Production**:- That is possible because milk is transmitted direct from the cows udders to the churn or milk cooling tank entirely

untouched by hand and free from air-borne contamination.

(ii) **Saving of Production Cost**:- The saving in labour costs is largely a matter decided by the size of the herd, but as a general rule, little advantages may be gained from the use of a milking machine unless the herd consists of at least 30 cows in milk. A herd of 30 to 35 cows can be machine milked by two (2) men to perform this by hand in a similar time would require four (4) milkers.

The milking process can be carried out effectively if all available milk in the udder is removed with the minimum of labour, rapidly and without causing injury to the udder.

To ensure optimal oxytocin action it is essential that cows be rounded up to the milking parlour calmly and slowly. They should under no circumstances be hit or shouted at or driven with dogs. Cows awaiting milking should be treated calmly. Noise and rough handling of milking cows in the milking parlour should be avoided. Any treatment of a cow in the milking parlour, which is coupled with irritation, pain or fright, is thus undesirable. The cow should associate a milking parlour with a milking process, which is carried out in a peaceful and silent atmosphere.

If these golden rules are not adhered to not only will the process of letting down milk be delayed or even prevented, but the flow of cows through the milking parlour will be hampered as the cows will be afraid of entering the milking parlour.

Facilities for feeding concentrates should be outside the milking parlour. Feeding concentrate outside the milking parlour eliminates dust conditions and wasting in the milking parlour. Each quarter (teat) should be tested for mastitis before milking. One or two jets of milk are milked out of each teat into the mastitis - testing beaker. Visible clots, flakes watery milk or festering milk are abnormal and indication of mastitis. A cow with mastitis may under no circumstances be milked with the machine among other cows.

Cows tested negative for mastitis should have the lower third of the quarter washed with clean running water from the pipe. A rag, sponge or cloth/sack should not be used as the material transmits mastitis bacteria from cow to cow. Milkers preferably should wear smooth cloves, which are dipped in a disinfectant between milking of different cows. A disinfectant such as chlorinated lime added to water is useful for this purpose. Washing the udder, which should last at least 20 seconds acts as stimulation. Very dirty udders are usually washed a little longer.

After washing the udder is dried with a disposable towel. Removal of the dirty water running down the udder to the tip of the teat ensures hygienic milk with a low bacterial count.

The process of testing of mastitis, washing and drying lasts approximately a minute, after which the teat cups are applied to the teats. The claw piece and one teat cup should be held in preparation to apply the teat cup to the teat.

During the milking process care should be taken that air does not enter between the teat and teat cup liner. Any flow of air will cause irritation and promote mastitis.

As soon as the milk flow decreases at the end of milking the teat-cups are stripped (removed) by using the hand to exert slight pressure on the front on the claw piece. Stripping (removing) the teat cup should not last longer than 15 to 30 seconds. If the process is not carried out carefully the teat canal will be injured which can give rise to mastitis.

The vacuum is cut off as soon as the milk flow stops. Air is then let into one of the teat cup linings by pressing the teat in such a way that air can enter next to it. No force should be necessary and the teat cups are then easily removed.

After the teat cups have been removed each teat should be dipped into a gentle disinfectant (usually with either iodophor or hypo chlorite solution). It is important the solution (disinfectant) is replaced regularly and is not left in the open to the air between milkings as it may go flat (lose effect).

Milk clinging to the rubber teat-cup linings should be rinsed off with clean running water or disinfectant in the water. Teat cups should not be dipped in water, as the milk of cows with invisible mastitis will infect the water in the pail and the bacteria are thus transmitted from cow to cow.

Dipping teat cups quickly into a pail of water with disinfectant will not rise in the teat cups. Although it is not practical, time consuming and expensive, the best way to disinfect the teat cups between cows milking is to dip the teat cups in hot water that is 85˚C for 30 minutes.

After milking the cows are left to leave the milking parlour peacefully, and not hit to make them go. Where cows are given concentrate in the parlour during milking sometimes it is difficult to induce the cow to leave the milking parlour. Cows become used to a certain routine in the milking parlour. Milkier should be trained to use the same routine every day with all milking cows. A single person can handle three units with ease in the case of a herringbone and or tandem milking machines. Milking machines are the best labor savings aids in the dairy industry. Where the maintenance and handling of milking machines are neglected this can cause injuries to the udder thus leading to mastitis and eventually low milk production.

The training of milkier and their supervision largely determine the effectiveness of machine milking machines. Injuries to the udder, bacterial infection and a decrease in milk production can in nearly all cases be ascribed to milking techniques in the milking parlor.

MASTITIS AND PREVENTION

The term mastitis means “inflammation of the udder”. The actual form it may take is highly variable and the infection can be caused by a large variety of microorganisms. For this reason the actual cause of mastitis is difficult to assess and specialized procedures are necessary to establish the causative agent. The National Veterinary Laboratory (NVL) can accurately determine the causative microorganism. Most farmers use the strip cup and Californian milk tester to detect mastitis and then treat the

affected quarter or quarters. Any treated animal should be milked and treated separately or last because mastitis is a contagious infection.

Milk from mastitic quarters should be discarded and not feed to calves and or pigs as is common practice. Mastitis infected quarter/quarters should be hand milked and not machine milked to avoid spreading the disease

Somatic Cell Count: Should be done every fortnight. Somatic cell counts also determine the grade of milk for the farmers to be paid for their milk. The cell count is made of white blood cells in the milk. These cells are part of the animals defence mechanism and they tend to increase dramatically when an infection is present. It is however unwise to place more emphasis on the cell count results of a milk sample as an increase in white blood cells (leucocytes) also occurs at the start and towards the end of any lactation. The number of cows in early and late lactation as well as mastitis cases as taken of a bulk milk sample, therefore influences the overall somatic cell count. The following are the normal standards applied to cell counts: -

300 000 to 500.000	=	normal
500 000 to 750 000	=	moderate
750 00 to 1 000. 000	=	high
1,000.000 and high	=	very high

A farmer who does not carry out mastitis - control programme may find that 50% or more of his herd is carrying mastitis in the sub-clinical form. As mentioned above early and late location can influence the somatic cell count. Sub-clinical mastitis cases carry mastitis causing microorganisms and do not produce their potential maximum causing the disease to be seen with a naked eye. These animals may rid themselves of the diseases or may deteriorate into clinical cases.

Under these circumstances the cell count can carry between 500,000 and 1,000,000 and a cause for concern to the farmer. Under these circumstances the cows will not realize their full production capacity.

There is no single treatment that will remedy this situation overnight. Strict hygiene will produce the desired results.

California Mastitis Test: - This test is more sensitive in detecting mastitis than the strip cup but needs experience for accurate interpretations. The test indicates presences of white blood cells concentration but as with the other methods of assessing cell counts it can give reactions to cases of early or late lactation. It is therefore essential to distinguish positive reactions. It is essential that cows quarters (teats) are tested before each milking and positive reactions treated before too much udder-tissue damage is done.

Dry Care Therapy: This treatment is given to cows that are being dried off. An antibiotic is administered in a form, which produces a slow release of the drug over a period of three weeks. This presence of antibiotics over this period is considered highly beneficial, as it is often at this stage that cows are infected. At the end of this period the udder should have dried out and out of the danger.

Clinical Mastitis:- If a sound mastitis control programme is used it is unlikely that a mastitis outbreak of any proportion will occur. The farmer can always expect a small percentage of his milking herd to contract mastitis. The mastitis control programmes is aimed at keeping sub-clinical mastitis cases at a low and easily manageable level and eventually reduce it to a minimum. The results of a programme may become evident after two (2) to three (3) years. Farmers usually keep antibiotics and may remedy the mastitis if it is not too serious. Cases of bacterial resistance to specific antibiotics are fairly common and can lead to a far serious problem. Should a cow not react to treatment a veterinarian should be consulted. Mastitis may already have become chronic and on closer inspection, a few hard lumps can be felt deep in the udder tissue. Chronic mastitis cases should be eliminated from the herd, as such animals are frequently important sources of infection. Mastitis is usually localized and affects only the cows udder, but the more serious infections can lead to rise in temperature and loss of appetite. In such cases the udder usually becomes swollen and very painful. Acute infection which can be caused by a number of bacteria often results in the death of a cow

or in production of polluted milk if expert advice is not sought in time. A dairy farmer should understand that mastitis can only be controlled by efficient, hygienic control measures to prevent mastitis infection outbreak must be traced as a matter of urgency and or priority for it will be useless to treat individual cows and not remove the cause of the problem "mastitis ". A farmer should be aware of what mastitis is and how to control it under normal circumstances. When complications occur a veterinarian should be called in, it will be a saving in the long term.

DAIRY HERD RECORDS

The operation of a modern dairy farm requires the keeping of records just like any other progressive business. Records are particularly important as far as the dairy herd is concerned, as well as the operations of a dairy farm. If records are kept and properly used they can serve as the basis for developing a profitable enterprise. Lack of records can result in mediocre success or business failure. There are various types of herd records as follows:-

Identification of Cattle: Herd records depend first of all on the positive identification of each and every animal in the herd. In the case of registered animals, each breed association has very specific requirements. With Ayrshire, Guernsey and Holstein cattle a sketch of local markings on both sides of the body must be shown. In the case of the Jersey, Brown Swiss, Dairy Swiss (Braunvieh) breed's animals must be given a tattoo number in the ear.

Because tattoos are hard to read and the use of coat marking depends primarily on memory, the day-to-day operations identification of cows in larger herds requires that other methods be used. The most common method of identification is the ear tag. Other methods used are the neck chain and the neck strap, all of which carry a numbered metal or plastic plate with numbers.

Breeding Records: The ideal calving interval for the dairy cow is 12 to 13 months. In other words it is desirable to have every cow in the herd freshen every 12 months. In order to approach this goal as closely as possible dates of freshening (parturition), heat

periods, breeding, abnormal conditions etc must be recorded. Such records serve the following:-

(i) Indicate when to start breeding
(ii) Aid in feeding programme
(iii) Indicate feeding efficiency
(iv) May suggest disease problems or need for veterinary service
(v) May suggest infertility of a bull being used
(vi) Indicate when to turn cow dry
(vii) Indicate approximate date of calving
(viii) Show parentage and calving date.

Through record keeping a dairy - man has a complete reproductive history of each cow in the herd. He knows when she is due to be bred, when she is bred, the sire used, and when she is due to freshen. If the cow does not come into heat or does not conceive in the normal period of time, the dairyman has the information readily available. Breeding normally should be started 60 to 90 days after calving. This timing gives the fresh cow a better chance to recover from any uterine infection and generally results in conception with fewer services. With such records a breeding problem usually can be detected before it has done serious damage and the veterinarian can identify the cause of the problem much more readily. The cow can be turned dry on the proper date so that there will not be an excessively long wasteful dry period or a period so short that the cow does not get adequate rest. A dry period of 60 days is considered ideal. A breeder of purebreds has to maintain accurate breeding records for purposes of registering animals and writing pedigrees. In fact he is normally obligated to do so.

Additional records are kept for: -

(i) Purebreds verses grades
(ii) Sale of breeding stock
(iii) Milk Production indicating milk production per cow per day and total milk production for the total herd in the farm.
(iv) Type of milk market
(v) Size of herd

(vi) Financial resources of dairyman
(vii) Milk quality control tests results
(viii) Financial records i.e. expenditure/income records

DAIRY HERDBOOKS

It is desirable that dairymen and women use a dairy herd book to maintain the necessary records on their cattle. Such books vary from complex expensive types to inexpensive notebooks. A substantial and fairly complete handbook is particularly useful for the breeder of purebred cattle. It also can be used to advantage by the breeders of grades (not purebred). Some breeders carry a pocket size herd book, which is particularly useful in discussing the records of animals with prospective buyers.

A good herd book should provide for recording such information as the name and registration number of the animal, names and numbers of sire and dam, date of birth, breeder, breeding record including name, number, sire and disposition of each off-spring, daily monthly and lactation period of (305 days) production of milk, the age of cows at which the records were made, a health record form and pedigree of three generations. Such records when kept over a period of many years are of great help in herd improvement.

BOTSWANA DAIRY ASSOCIATION

The Botswana Dairy Association has been formed by dairy farmers in Botswana to serve as a mouthpiece for the farmers to negotiate with government and or with other organization, thus protecting the farmer's interests.

Status of the Association

(i) The Association is an autonomous specialist organization within organized agriculture and may or may not affiliate to another Agricultural Organisation.

(ii) The Association is a voluntary association of persons involved in the dairy farming and or industry who uphold the same objectives. The association is a

corporate body independent of its members and the autonomous exponents of rights and obligations. The association may conduct any legal act and may on its own institute any legal proceedings. The executive, or any persons properly authorized by the Executive shall represent such legal act or legal proceedings.

(iii) Members liability for debt owed the association is limited to the members unpaid subscription, as well as any other amounts owed the association by the members.

(iv) Funds at the association disposal shall only be applied in furthering the objectives of the association, and shall not be divided among members or other persons.

Objectives of the Association

The objectives of the association are: -

(i) To serve as a mouthpiece for the milk producers to promote the interests of the dairy industry as whole.

(ii) To promote a spirit of co-operation and solidarity among milk producers, to further the welfare of the milk producers through concerted action and to act as a united body with regard to all matters relating to the industry, provided that all matters shall be dealt with purely on merit and shall under no circumstances be approached from a party - political point of view and or own interest.

(iii) To promote the efficient production and orderly marketing of milk, and to negotiate the best prices and benefits for milk producers.

(iv) To further the cooperative system among its members.

(v) To endeavour to establish, maintain and promote the best relations between producers, consumers and processors of milk and dairy products.

(vi) To submit where and when necessary the coordinated opinion of its products on milk matters to the government or other authorities and to collaborate in the solution of problems, provided that where there is a conflict of interest between the agricultural commodities, the matter shall be referred to the congress.

(vii) To extend support to organizations whose objectives and activities are conducive to the promotion of the objectives of the association.

(viii) To collect and process all relevant information on the milk industry and to make it available to milk producers by way of efficient communication, and

(ix) To promote the consumption of milk and dairy products and to take all other steps that are in the interest of the industry.

CONCLUSION

The Dairy Section, Ministry of Agriculture will highly appreciate if this handbook was worth reading given the endeavor by the author to outline some of the basic management requirements for a successful dairy business enterprise. Notwithstanding, aspiring dairy farmers have to source more information from dairy journals, workshops etc.

It is worth to note that dairy farmers should use expert advice from dairy extension officers and veterinarians. A dairy farmer must be a good manager who keeps records and manages his finances amicably. Milk production is highly dependant on good quality feed and therefore dairy cattle of good dairy genetic potential should be fed well balanced rations to produce good quality milk and good yields.

Dairy farming has no holiday and it is worth the farmers taking a break but leave a good manager in charge of the running of the dairy in his absence. A dairy farmer should have passion for dairy

cattle farming and not to take it as a hobby but as a business enterprise. A dairy farmer should enjoy his/her work.

Hygiene must be strictly adhered to at all times for a good farm gate price. Some of the basic guidelines for a profitable dairy enterprise are as follows:-

(i) The dairy farmer should ensure his cows calve every year and heifers calve at 2 years old.

(ii) Good calve rearing managements practices and reduced calve mortality.

(iii) The farmer should set targets and methods to achieve them.

(iv) Produce good feed either through irrigation or rain fed. The farmers should ensure there is always ample feed for the cows and clean water daily for watering the animals and cleaning equipment.

(v) The farmers breeding programme should achieve high fertility and reduced calving difficulties and mortality

(vi) The farmer must monitor the heifers growth as replacement stock.

"You Are Now a Good Dairy Farmer Committed To His/Her Daily Work with Passion"

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