




HEIFER[®]
INTERNATIONAL
TANZANIA



Ending Hunger and Poverty

Intergrated Smallholder

DAIRY FARMING MANUAL

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Heifer International Tanzania



DAIRY FARMING MANUAL

Second Edition

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Special thanks are directed to Erwin Kinsey the first Director of Heifer Tanzania Program for developing the first small holder dairy manual which has provided a basis for development of this manual.

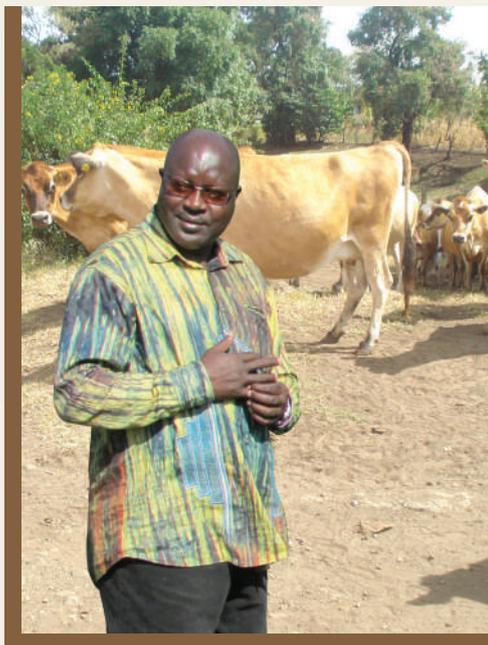
I would like to also recognize the staff of the Ministry of Livestock and Fisheries Development, Heifer Project International- Tanzania Staff, Project Supervisors and Holders whose valuable contributions have significantly improved the quality of the contents of this manual.

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It might be not possible to name each and every one of those who have sacrificially contributed to the development of this manual. May you please accept this note as a gesture of appreciation to your contribution for so you highly deserve.



FOREWORD



Dairying as an enterprise has got a place alongside other viable tools of poverty alleviation, besides creating job opportunities to jobless families in Tanzania.

Statistics from the ministry of Livestock and Fisheries Development show that there are about 800,000 improved dairy cattle in Tanzania. This herd is producing about 2 billion liters of milk a year. This volume can double if farmers can adhere to the appropriate animal husbandry practices and if these volumes can access a stable and sustainable market.

The per capita milk consumption index in Tanzania stands at 45 litres per year. This index is very low when compared to the recommended by FAO of 200 litres per year.

This manual is a contribution by Heifer Project International Tanzania Program, towards improving dairy cattle productivity, will be translated into improved livelihoods through increased family income and the attainment of family food security.

It is my hope that this manual will significantly help to bring the desired change in the livestock industry whereby small holder farmers will adopt the new animal husbandry technologies elucidated in this manual for increased family income and that of the nation at large.

Dr. Henry Njakoi
Country Director
Heifer Project International-Tanzania



INTRODUCTION

HEIFER PROJECT INTERNATIONAL

June 18th, 1944, 12 days after the D-Day invasion in Europe, another campaign began that would save the lives of millions. On that day, Heifer International launched its first four-footed attack against hunger—a shipment of dairy cattle bound for Puerto Rico. Five years earlier, as a relief worker in the Spanish Civil War, Indiana farmer Dan West had been forced to decide who would receive limited milk rations and who wouldn't—literally, who would live and who would die. Relief aid, West knew, would never be enough. West returned to the United States and formed Heifers for Relief, an organization dedicated to ending hunger permanently by providing families with livestock and training that would allow them to feed and care for themselves. In cooperation with the U.N., the group shipped thousands of cattle to France, Germany and other war-torn areas in the late 1940s.

Today HPI- a non-profit, humanitarian organization that provides livestock, training and related support to assist low-income families to improve food security and family livelihoods and to care for the earth through the sharing of livestock and to help local economies.

It trains people around the world in environmentally sound agricultural practices, integrating crops and animals. But it retains Dan West's spirit and his desire to end world hunger. While in Spain Dan west believed that "It wasn't a cup of milk they wanted but a cow"; He also believed that " If people are changed they can change the world"

Heifer Project International today is implementing livelihood projects in more than 125 countries in the world including 38 States of the United States of America.

HPI made its first entry into Africa and to Tanzania in particular in 1973 when 1000 Holstein Friesians were airlifted from the USA to the alpine grassland and montane forest plateau DAFCO Kitulo Farm.

From 1981 HIT pioneered work with smallholder farmers, a program which to date has directly, successfully and sustainably supported over 120,000 low income families.

Passing on the gift has been the philosophy of Heifer operations worldwide. Instead of providing poor families in need with non-renewable source of food, Heifer International provides a "living loan" of an animal and the training to take care of it. The family "repays" the living loan by passing on one or more of their gift animal's offspring to another family in need, and the process goes on and on.



Mission Statement:

The Mission of Heifer International Tanzania is to work with communities to end hunger and poverty and care for the earth.

Vision Statement:

In reaching Heifer's global vision, Heifer International Tanzania goal by year 2017 is to be world of communities living together in peace and equitably sharing the resources of healthy planet.

Heifer Tanzania collaborates with the government of Tanzania through the Ministry of Livestock Development and Fisheries and Sub Project Holders to administer the livestock program for alleviating hunger and poverty to resource-limited communities through provision of livestock, training, veterinary services and technical expertise.

The following animal species have been used as project animals by Heifer international Tanzania Program:

- Dairy cows
- Dairy goats
- Chevron goats
- Pigs
- Local chicken
- Donkeys
- Camels
- Bees
- Pond Fish

HPI will continue transforming the lives of small holder families by linking them to commercial markets, for the purpose of creating sustainable incomes and robust value chains that benefit all industry stakeholders.

Heifer Cornerstones for Just and Sustainable Development

PASSING GIFTS

- P** = Passing on the Gift
- A** = Accountability
- S** = Sharing and Caring
- S** = Sustainability and self-reliance
- I** = Improved Animal/Resource Management
- N** = Nutrition, Health and Income
- G** = Gender and Family Focus
- G** = Genuine need and Justice
- I** = Improving the Environment
- F** = Full Participation
- T** = Training, Education & Communication
- S** = Spirituality



1. Passing on the Gift

Passing on the gift embodies HPI's philosophy of practical sharing and caring. Every family who receives an animal signs a contract to pass on the first female offspring to another family in need and also agrees to pass on to others the training and skills that they have acquired. Many groups also choose to "pass back" an additional animal, or else a portion of sales income, to support their projects.



2. Accountability

Groups define their own needs, set goals, and plan appropriate strategies to achieve them. HPI provides guidelines for planning the project (including the pass-on process), screening recipients, monitoring farmers' progress and conducting self-evaluations. Groups are responsible for submitting semi-annual monitoring reports to HPI.



3. Sharing and Caring

HPI believes that global problems can be solved if all people are committed to sharing what they have and caring about others. Though not easily measurable, this is one of our most important cornerstones. Sharing and caring also reflect our commitment to humane treatment of the animals in HPI projects and our shared vision of justice for all people.



4. Sustainability and Self-reliance

Because HPI funds projects for a limited time, project groups must plan to support themselves eventually. HPI has found that self-reliance is most easily achieved when a group has varied activities and generates support from several sources.



5. Improved Animal and Resource Management

Feed, water, shelter, reproductive efficiency, and health care are the essential ingredients in successful livestock management. These must be available so that the livestock provided by HPI can be kept healthy and productive. The animal should be a vital part of the farm activities without causing an extra burden on family members or the farm resources in general. The species and breed chosen must be appropriate for the area.



6. Nutrition, Health and Income

Livestock contribute to human nutrition and well-being in two ways. Directly, they provide high quality protein and fiber and, indirectly, draft power for crops and transportation as well as manure for soil fertility. The livestock should have potential for profitability to provide income for education, health care, housing, and all emergencies. As living savings accounts, livestock also provide long-term economic security.



6. Gender and Family Focus

Gender refers to the socially-defined roles of men and women in each culture. HPI's gender program encourages women and men to share in decision-making, ownership of the HPI animals, labor, and the benefits of projects. Priority for funding is given to projects in which the whole family participates. On-farm employment strengthens rural families and communities by decreasing the need for migration to urban areas in search of employment. In addition to the gender program, HPI's WiLD (Women in Livestock Development) program supports women's projects.



8. Genuine need and Justice

HPI is partner to people who truly need an opportunity to improve the quality of their lives, and who can benefit from modest support. Group members develop their own criteria to determine who will receive animals and related inputs. The poorest in the community should be included in the group membership and receive priority for assistance. Families are eligible regardless of creed or ethnic heritage. Priority is given to groups that have traditionally been neglected.

- Trust and belief with each other and respect others
- Lots of positive changes in the family/community
- Sustainable plan for self-release, self-empowerment/development
- Cooperate with each other and peace social environment
- Sharing and caring with each other
- Pride and ownership feeling
- Improved civilization (brotherhood/sisterhood)
- Self motivation for the transformation



9. Improving the Environment

The introduction of HPI livestock should improve the environment by having a positive impact on one or more of the following: soil erosion, soil fertility, sanitation, forestation, biodiversity, pollution, wildlife, and watershed conditions. In addition, the livestock should not cause or worsen any environmental problems.



10. Full Participation

HPI works with grassroots groups or intermediary organizations representing grassroots groups. A truly effective group has strong leadership and organization and is committed to involving all members in decision-making. Members of the group "own" the project, and the groups have control over all key decisions.



11. Training, Education and Communication

Groups decide their own training needs and local people are involved as trainers. Training includes formal sessions as well as informal (farm visits, demonstrations, model or promoter farmers) and is “hands-on” more than academic. In care of the environment, groups have requested training in diverse topics such as food processing, marketing, group formation and human nutrition.



12. Spirituality

Spirituality is common to all people and groups, regardless of their religion or beliefs. Spirituality is expressed in values, beliefs about the value and meaning of life, a sense of connectedness to the earth, and a shared vision of the future. It often creates a strong bond among group members and gives them faith, hope and a sense of responsibility to work together for a better future.





TOPIC NO. 1: SELECTING A DAIRY COW

Introduction

The choice of which dairy animal to keep should be done prudently. For a long of time many have been holding a notion that local or indigenous cattle are not meant for milk production. This notion is not right in its entirety. Indigenous cattle can produce milk however little it may be. Great variations exist in the milk producing ability of African breeds of indigenous cattle. Deliberate efforts might well be undertaken to select for milk producing ability from within the traditional herds in order to develop a breed with a predictable milk producing ability, which might also maintain all the desirable traits of the traditional cattle. In Africa for hundreds of years local cattle have adapted to the heat, to rigorous local conditions and management and have developed some resistance to the disease that abound. These indigenous cattle can become slightly better milk producers if they are raised in improved environments and husbandry.

Breeds of dairy cattle

Purebred dairy cattle have been selected for many years, with most of the known popular breeds coming from colder temperate climates.

They are characteristically large consumers of forages and water, producing anywhere from ten to fifty litres of milk per day.

Breeds of dairy cattle can be categorized into three groups:

- Purebreds
- Crossbreds
- Indigenous

Purebred dairy cattle include the following:

- Friesian
- Ayrshire
- Jersey
- Brown Swiss

Crossbreds are resultant off springs having at least 50% to almost 87.5% of exotic bloodlines from dairy breeds viz Friesian, Ayrshire, Guernsey, Jersey and Brown Swiss after crossing with indigenous breeds.

Characteristics of different breeds of dairy cattle.



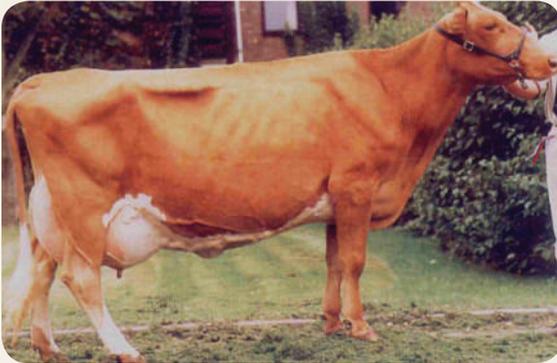
Friesian:

- Large, black and white marked
- The breed currently averages 9900 litres per lactation
- A female Friesian weighs an average of 680kgs while a bull averages 1000kg
- It is the highest milk producing breed.
- It has the lowest milk fat percentage which averages 3.4%
- Due to its large body size the breed is characteristically the largest consumer of forage among the exotic breeds.



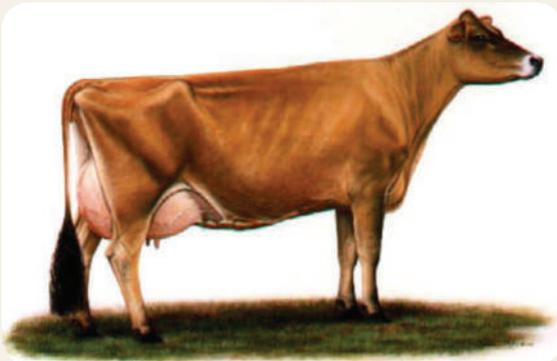
Ayrshire

- The breed has white and red marks
- The female weighs between 450 – 600kgs while a male animal weighs between 635 – 900kgs
- Milk fat percentage averages 4.0%
- Ayrshire produces about 8000 litres per lactation



Guernsey

- It is orange/ red and white in color
- Milk has a golden color due to high content of carotene which is a source of vitamin A.
- Milk butter fat percentage averages 4.5%
- The cow weighs 450 – 500kgs while the bull weighs 600 - 700kg
- Guernsey cow produces about 6000 litres of milk per lactation.



Jersey

- The breed comes in all shades of brown from light tan to dark brown
- They are frequently fawn in color
- All purebred jersey have a lighter band around their muzzle.
- A female jersey weighs 400 – 500kgs while a male jersey weighs between 540 – 820 kgs.
- Jersey cow produces about 5700 litres of milk per year.
- The milk fat stands at 5.5%



Brown Swiss

- Produces the second largest quantity of milk per lactation. i.e. 9000litres/lactation.
- Milk for percentage stand at 4%
- It is known for its long gestation period extremely docile temperament and large furry ears.
- Brown Swiss can be grey or tan color.



Crossbreds

These are offspring's resulting from crossing bulls of exotic bloodlines with indigenous females. Cross breeds can as well be as a result of crossing between exotic bloodlines.

There are 4 groups of crossbreds depending on the percentage of exotic bloodline the resultant cross bred offspring has. These are:-

(a) A crossbred with 50% exotic bloodline (F1)

- This one is a result of crossing an exotic bull with an indigenous dam cell.
- A crossbred of this type will be a better milk producer than the indigenous dam cell parent.
- Will be resistant to diseases better than exotic pure breeds.

(b) A Crossbred With 75% Of Exotic Bloodline (F2)

- This one is a result of grossing an F1, with an exotic pure blood line bull.
- A Crossbred of this type will be a better milk producer than the F1, but relatively low resistance to diseases.

(c) A crossbred with 87.5% of exotic bloodline (F3)

- This one is a result of crossing an F2 cow with an exotic pure bloodline bull.
- A crossbred of this type will be a better milk producer than the F2 one, but with a low level of diseases resistance as compared to an F2

(d) A crossbred with 93.75% of exotic bloodline

- This type of crossbred is a result of grossing an F3 Indigenous cow with an exotic pure bloodline bull.
- A Crossbred of this type will be a better milk producer than an F3 but with a relatively low level of disease resistance compared to an F3.

How to choose a good quality cow.

When one chooses a good quality dairy cow it is advisable to do so abiding by the following:

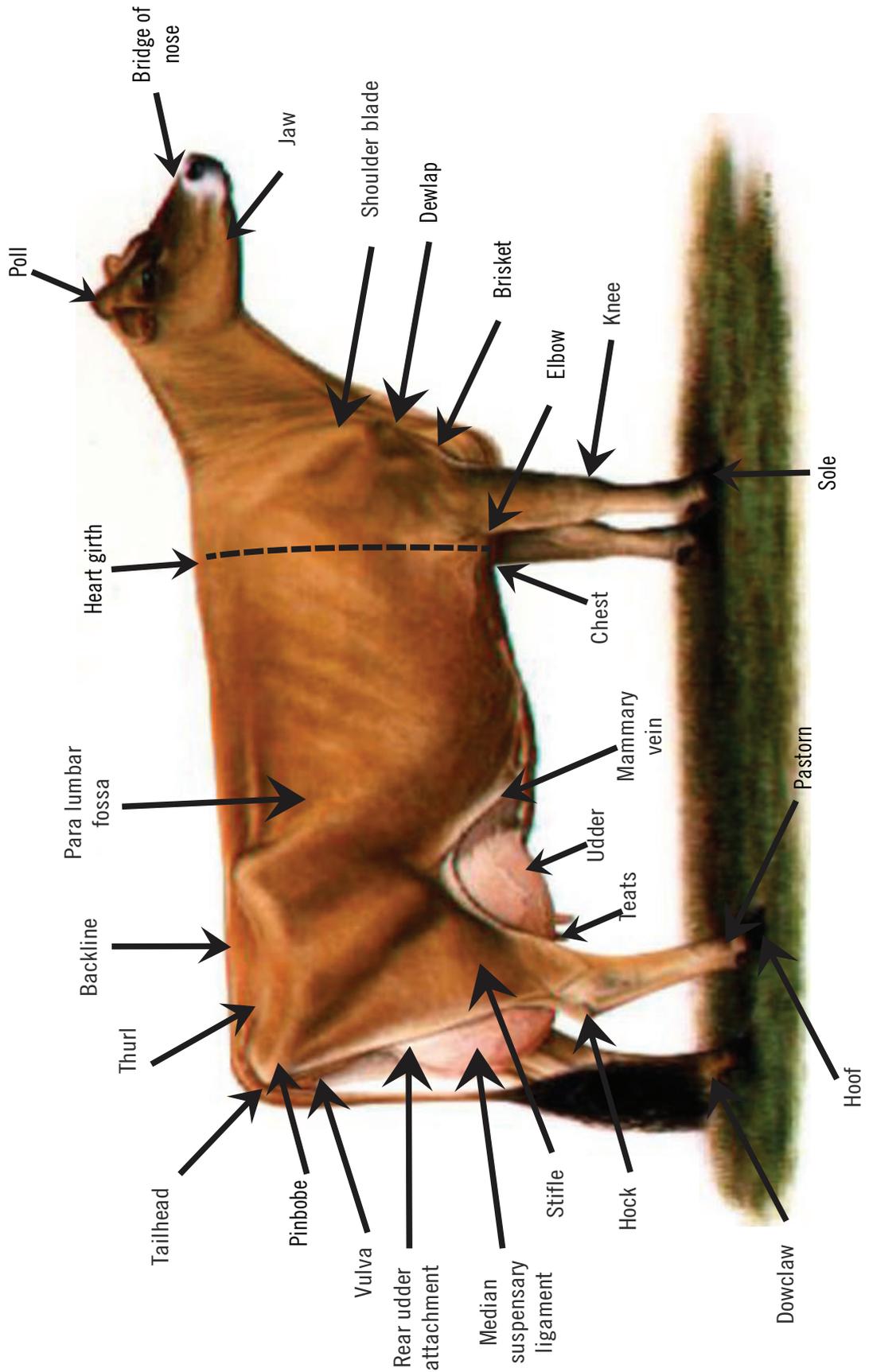
- One's preference
- Ability to feed and manage
- Availability of breed of preference

Unfortunately most farmers have to learn for themselves which breed is appropriate through sometimes costly errors

Qualities of good dairy heifer

- The heifer should be of a known pedigree.
- Has the capacity to consume much forage.
- Should be without any deformity, triangular in shape, with a body widening from the shoulder as you proceed towards the rear.
- Should have a shining coat and a bright demeanor
- Should have a wide deep udder, teats well placed, not too low below the hocks
- Alert and feminine without excessive fat
- Her rear end is wider and square to facilitate easier calving.

PARTS OF THE COW





TOPIC 2: APPROPRIATE SHED FOR A DAIRY COW

Introduction:

An appropriate cow shed for zero grazed dairy cow should have a firm place where an animal can stand comfortably while eating and a dry protected place where she is able to lie down in comfort.

Why a good quality cow shed?

- A good quality shed allows easy cleaning. This reduces incidences of mastitis. (Inflammation of the udder)
- Prevents animals to be in their own manure and hence contamination of milk during milking is reduced.
- A good quality shed affords of the animal space for exercise
- A good cow shed should protect the animal from rainfall and prolonged direct sunlight.

Qualities of a good cow shed

- The shed should be adequately enclosed to prevent other livestock pets and possibly in some areas wild predators, from entering.
- It should be large enough for the cattle to move within it freely from one area to the other.
- It is partitioned into areas viz; resting areas enough for resting, permanent water and feed trough or manger.
- This eating area should preferably be made of concrete floor not too smooth to cause slipping.
- The floor should have a slight slope backwards away from the manger to allow liquid manure to drain off into the canal and ultimately into a collection hole which is dug into the ground outside the shed.
- The roof should not leak.
- It should have a crush for physical restraint of the animal.
- Should allow sunlight in for the animal to be able to make vitamin D from sunlight energy.

Site selection for cow shed construction

- A cow shed for a zero grazed animal should be within the boundaries of a home stead for security purposes
- It should be built opposite to the frequent wind direction of the locality to avoid foul manure smell to engulf the whole home stead.
- Should not be built in water logging places.

Essential parts of a cow shed

i) Resting area:

- The resting area need not to have a cement floor. It is supplied with a soil bed.
- It should be raised about 15 cm above the level of the floor of the eating area to prevent any manure or urine flowing by gravity to dirt the soil bed.
- It should be fixed with a pole 60 cm from the wall and 1 meter high which causes the cow to move backwards when standing up thus causing the bulk of manure and urine to land on the floor of the eating area.



ii) Eating area:

- This area can be in an open air with only enough shade required to protect the manger, from direct sunlight and rain.
- It should be supplied with a rough concrete floor.

iii) A crush

A crush enables the farmer and livestock attendant to handle a cow or bull easily for vaccinations, examinations and spraying against ticks.

iv) Water and feed troughs:

These are permanent structures which will be filled with water and fodder at all times.

v) Calf pen

The structure should keep the calf in a clean environment to reduce problems of pneumonia, scours and worms, the three most common causes of calf losses

vi) Collection Hole

It is dug into the ground outside the shed where liquid manure and urine can drain into.

Table No.1

Rough estimates of the required shed construction materials

A	Resting area	Quantity	Length in cm
i	Front poles (Diameter 15 cm)	4	350
ii	Rear poles (Diameter 15cm)	4	320
iii	Middle poles (Diameter 15cm)	4	330
iv	Rafters (Roofing rafters)	3	500
v	Wood offcuts	40	400

B	Water and feeding troughs	Quantity	Length in cm
i	Front poles (Diameter 15 cm)	4	290
ii	Rear poles (Diameter 15cm)	4	260
iii	Rafters (Roofing rafters)	3	500
		20	400



C	Eating and exercise area	Quantity	Length in cm
i	Poles with a 15 cm diameter	6	200
ii	Wood offcuts	11	400

D	Crush	Quantity	Length in cm
i	Poles of 15cm diameter	8	
ii	Lateral rafters	12	

E	Milking place	Quantity	Length in cm
i	Poles with a diameter of 15cm	8	220
ii	Lateral rafters	8	200

F	Roof
	Roofing can be done using local available materials. These can range from grass to coconut leaves thatch. In the event resources allow then corrugated iron sheets can be used

G	Shed lateral walls		
i	It is advisable to use wood offcuts or poles so as to firmly restrain the animal in the shed		
ii	Nails of 4" long can be used to nail the offcuts to the vertical poles about 5 kgs can suffice.		



H	CONCRETE FLOOR
1	<p>7 - 50kgs bags of cement</p> <p>7 metric tons of stones</p> <p>42 buckets of sand</p> <p>63 buckets of stone quarry</p> <p>Concrete will be made by mixing cement sand and stone quarry at a ratio of 1:2:3 respectively</p> <p>Concrete made should be having thickness of 15cm</p>

NB:

The above mentioned shed construction material are meant for a shed to accommodate 2 cows

Crush

A cattle crush enable the farmer and livestock attendant to handle a cow or bull for easy vaccinations treatments, examinations and spraying against ticks. By following the recommended measurements and design it will function well for all classes of cattle.

- The vertical poles should be well placed 50 -60 cm deep the ground or cemented into the ground.
- Attach the horizontal poles to the inside of the vertical posts of the crush so they will with stand the pushing from the animal.
- It is advised that the crush should be 60 cm wide, 210 cm long and a height of 120cm.

NB:

It is good to have the milking place being separate from the main crush for animal restraint.

Calf pen.

The following designs are recommended for keeping calves in a clean environment to reduce the problems of pneumonia, enteritis and worms.

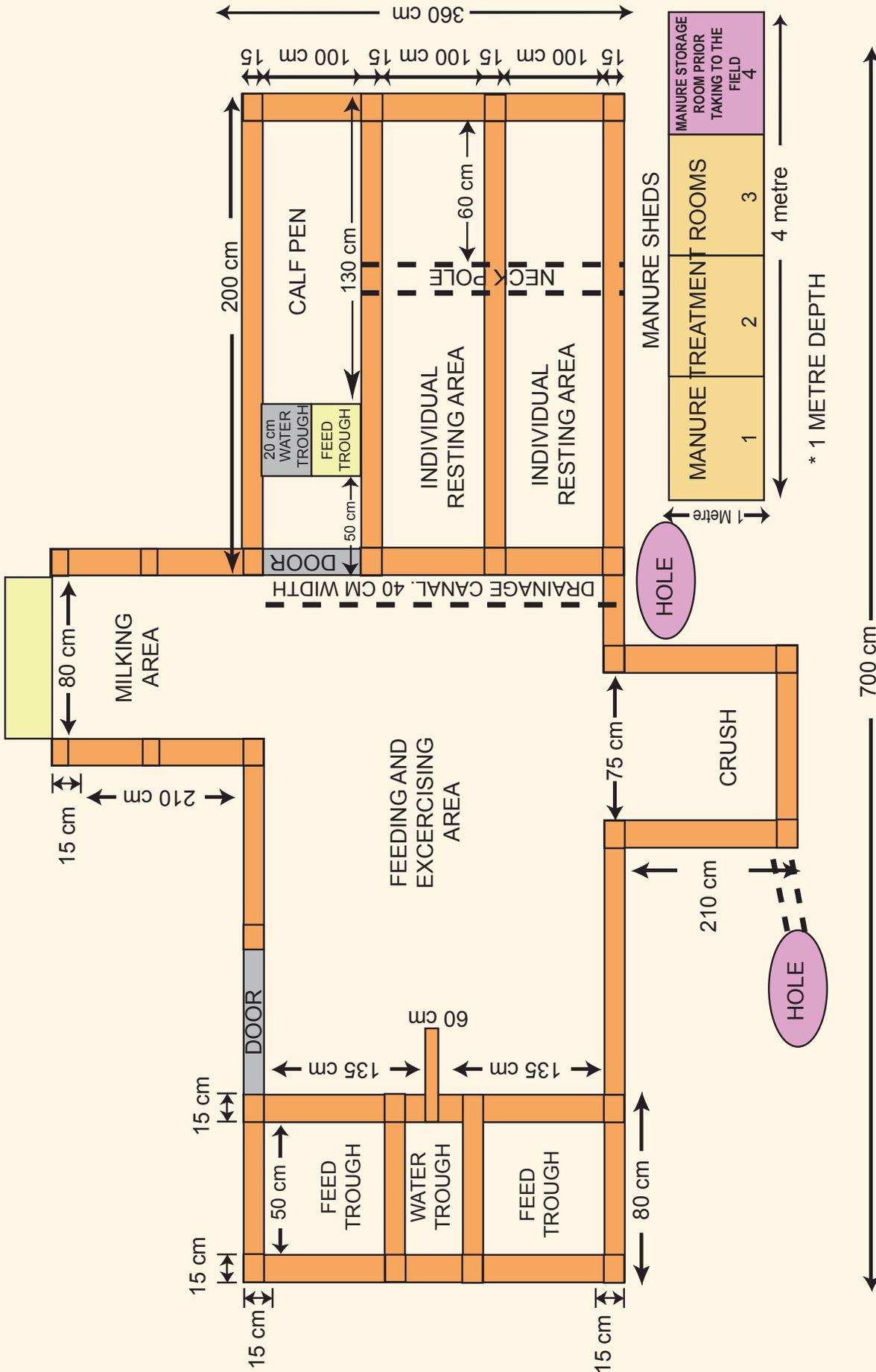
Not that in both structures water is available free choice and a trough is constructed to enable the calf to eat clean feed at all times.

In the raised slatted floor design, the calf has the added advantage of not lying in its own manure and urine, however this structure is quite open and needs to be housed under a larger shed.

The portable design is self-contained and may be moved around to encourage a clean place for the calf to walk and rest.



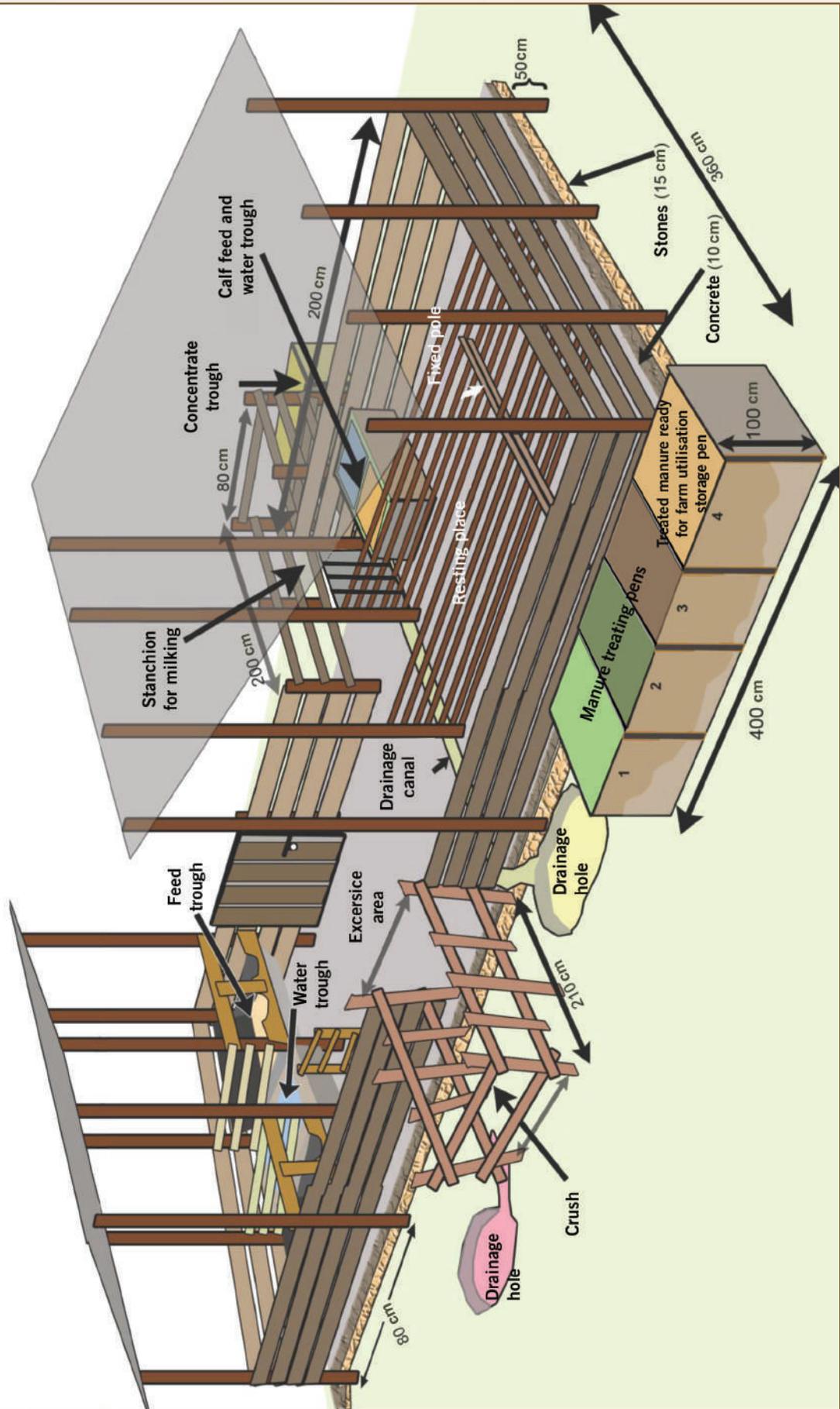
COW SHED PLAN AS SEEN FROM ABOVE

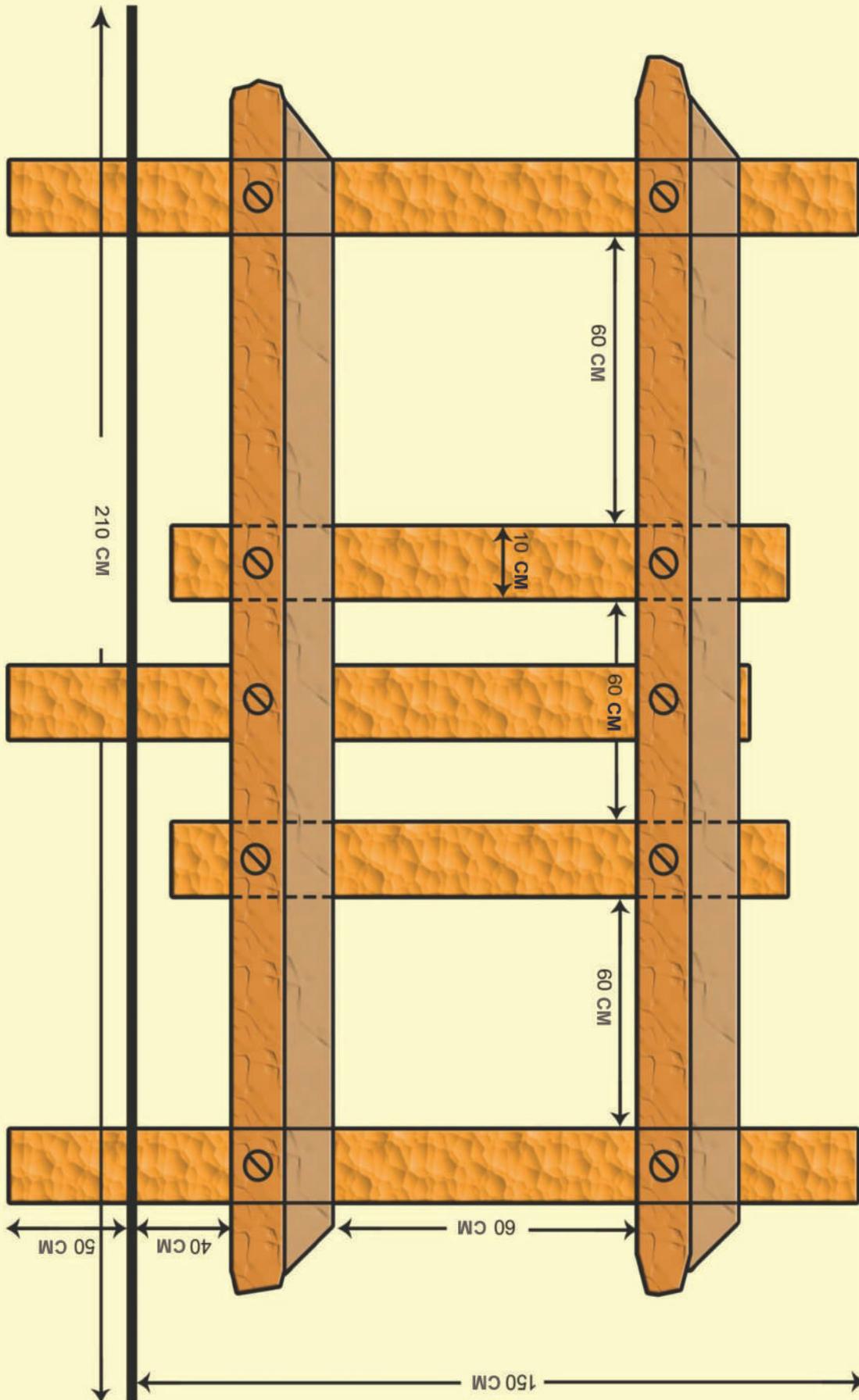


Cow shed plan as seen from above. The Shed is meant for two cows.



Shed plan as seen from above

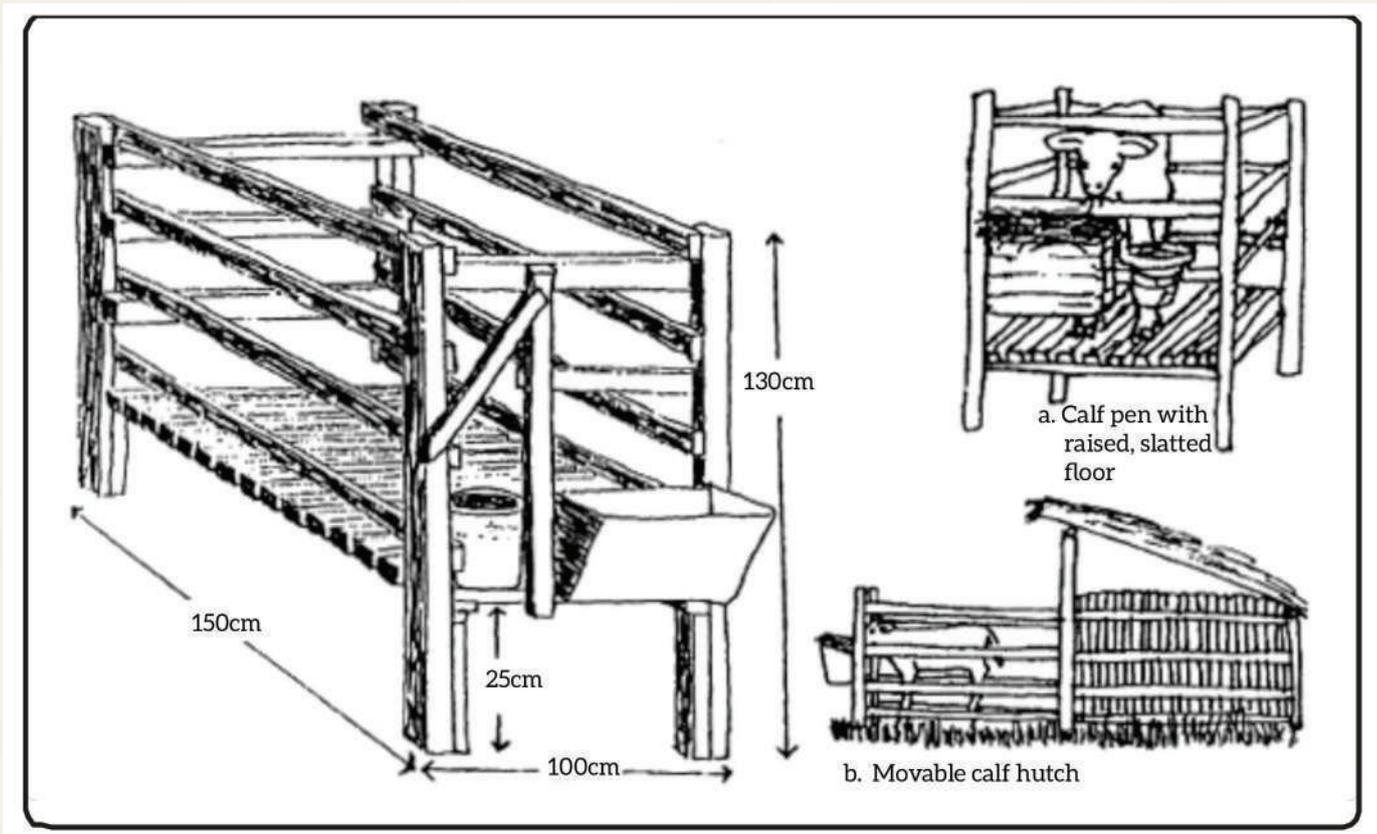




CRUSH



CALF HOUSING



TOPIC NO: 3 PASTURE ESTABLISHMENT AND MANAGEMENT

Introduction:

Pasture establishment is a fundamental prerequisite for successful and profitable zero grazing system of dairy cattle management. Dairy cattle especially cows in milk need much more feed than the local cattle. Pasture establishment farmers to have fodder for their cattle a year around.

Established pasture species can be grouped into two:-

- Grasses
- Legumes

Legumes and grasses which are appropriate to this system are the perennials, which do not need reestablishing each year and that give high production of high quality feed, rapid regrowth and are suited to variety of soils and climates.

Grass species can be divided into two groups viz

- Natural
- Established

Natural grass

Many types of natural grasses are found as weeds in fields and on communal or roadside lands. These can serve as feeds for a short period, more so they are not available in adequate supply. Thus they are insufficient for high producing dairy cows. In general grass which is everybody's on common land eventually becomes hard to come by.

Established grass.

This is grass planted on an area of land set aside for the purpose by a family. Established grass pastures have proved to be the surest source of fodder to a zero grazed animal besides relatively a least work attached to it.

Types of established fodder grasses

Elephant grass or 'Napier' (*Pennisetum purpureum*)

Is a tall grass which is reproduced by vegetative cuttings (not seeds) which can reach from 2 – 3 meters in height. There are many varieties, the most popular one in East Africa is called "Bana grass". It produces a maximum of green matter per unit area when supplied with adequate water throughout the year. It is the most palatable and nutritive when fed at an immature stage when the stem is still soft and no seed head has formed, usually at 1 – 5 m in height. If allowed to mature it forms a very hard stem so is less useful if not periodically harvested. When harvesting the fodder grass is cut to a level where the stump is left at 3 – 5 cm, of height above the ground during rainy seasons and at 10cm level during the dry season.



Elephant Grass



Guatemala grass (*Tripsacum laxum*)

This is a perennial grass which grows up to 1 meter in height. It does not readily form a stem such that it maintains its high feed value long enough into the dry season. It performs excellently with companion legumes such as desmodium spp.

When harvesting it should be cut close to the ground at 5cm in the wet season and at 10cm in the dry season.

Guatemala grass is reproduced by vegetative suckers, which later on form tillers. The tillers will at maturity aggregate into a tufts.

Setaria (*Setaria sphacelata*)

The grass is similar to elephant grass being highly productive and growing up to 1 m height. It is established form splits and utilized in a very similar manner to elephant grass but it is slightly more tolerant to cool temperatures. It is not as drought to resistant as elephant grass and performs well, where there is irrigation. The nutritive value is similar to elephant grass

but an advantage is that it does produce a seed head nor does it form a hard stem, if left to maturity hence it remains highly palatable throughout the dry season even within frequent harvesting.

It is commonly planted at distance of 20cm within rows in order to allow tillering within a few months. Rows should be at least one meter apart to allow for easy spreading of roots and companion legume if so desired. It is not as drought resistant as elephant grass and performs well where there is irrigation.



Setaria

Setaria species has two varieties; Nandi and Narok. Both are used for fodder production and erosion control. The Narok variety is gaining increased acceptance for its superiority in holding soil on contour lines.

Rhodes grass (*Chloris guyana*)

Produces less biomass per unit area than the afore mentioned species, being drought resistant it is more popular for drier climates. It can grow to a height of one metre including the tall seed head and it is a desirable pasture specie tolerating heavy grazing.

- It mixes well with companion legumes such as desmodium. It is also ideal for hay making in that it dries quickly and it is easy to handle.
- It can be established from seeds or cuttings and spreads easily by its and seeds.
- The seeds can be broadcasted or planted in rows with a spacing of 10cm between rows. Cover with no more than 1cm of soil.



Chloris guyana



Guatemala Grass



Guinea grass (*Panicum maximum*)

Guinea grass is similar to napier but not nearly as productive, however it is more drought resistant.

- It has the advantages of being able to be planted from seeds as well as splits as do several of the grasses.

Some of the other grasses in use and some of their advantages include:-

- Para grass (*Brachiaria mutica*)
- Molasses grass (*Brachiaria spp*)
- Congo signa (*Brachiaria decumbens*)
- These are good for wetter areas and also can be planted from splits or seeds. They are not as highly productive as napier



Guinea grass

Alternatives for dry areas and which are planted from seeds include the following:

- African star grass (*Cynodon plectostachyus*)
- Bufflel grass or African fox tail (*Cenchrus ciliaris*)



African Stargrass



African Foxtail



Desmodium ransonii

Legumes

There are two types of leguminous pastures:

- Herbaceous legumes
- Leguminous fodder trees

Herbaceous Legumes

Desmodium: The most popular herbaceous legume as companion to the tall growing grasses in the fodder plots of East African small holder dairy farmers. The most commonly planted are the both the green leaf (*Desmodium intortum*) and silver leaf (*Desmodium uncinatum*)

- It is a perennial plant established by seed or mature stems and climbs well to form a good mixture.
- Short lived or annual legumes whose herbage is popular as forage and whose beans are human food include lablab or cowpea (*Dolichos lablab*) velvet beans (*mucona pruriens*), phasea bean (*phaseoulos acutifolis*).
- Another important legume native to Africa is sun hemp (*crotalaria spp.*)

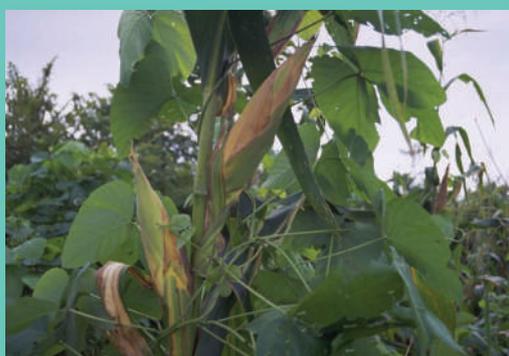
Fodder Trees:

Several trees are useful as fodder for cattle because they remain green and of high quality throughout the dry season producing ample green matter at a time when there is little available and they regrow at a fast rate producing more feed per acre than the highest producing grasses.

- Many grow wild in the forests but an increasingly important method of using them is by planting them for fodder. They can be planted on fodder strips or contours to improve the soil and check runoff erosion in the wet season, and wind erosion in the dry season.
- The legume trees can be planted on contours in 1 - 2 rows spaced about 20cm between rows and 2-3 cm apart.
- When planted as pure stands or fodder banks they can be planted in rows with distances between rows alternating at 30cm and 70cm intervals, in order to decrease weeding by more effectively cutting out light to provide an easy path between the rows for harvesting.



Phasea bean



Velvet bean



Lablab

Fodder Harvesting

Harvesting of the trees for fodder or mulch normally should be done by cutting them back frequently (monthly during the wet season, every three months during the dry season at a height of one half to one meter from the ground, depending on the crop planted besides them and according to the type of the tree.

- The preferred cutting tools are sharp pruning shears or secateurs which do not split or damage the shoot compared to saws, knives, hatchets or machetes.
- Choice of cutting tool can affect the overall regrowth rate as much as 30%.

Popular Species of fodder trees in East Africa

Leucaena (Leucaena leucocephala and Leucaena diversifolia)

It is a popular legume tree used in the widest variety of environments. *Leucaena leucocephala* is the most widely known. *Leucaena diversifolia* is more productive in higher altitude areas, and is growing in popularity for being pest resistant.

Planting

The seed should be heat treated in boiling water for 1 minute before planting.

Harvesting

When harvesting for fodder it can be cut as low as 10cm from the ground repeatedly although higher yields are obtained by cutting in at one half meter to a meter.

Feeding

Leucaena should not exceed 1/3 of the total ration units as a safe general rule.

Gliricidia (*Gliricidia sepium*)

It has similar praise as leucaena and has the added advantage that it can be grown from cuttings as well as from seed. It will grow on poorer soils than leucaena.

Planting

Its seeds need no pretreatment prior to planting and should be covered with very shallow layer of soil.

Harvesting

When harvesting for fodder it can be cut as low as 10cm from the ground. Care should be taken that a highly poisonous caterpillar which often lives in this tree is not fed by accident to livestock.



Sesbania



Flemingia



White Calliandra



Cajanus cajan



Feeding

It is not quite palatable so it must be introduced together with familiar feeds at first. Besides producing much bio mass, it is an excellent pole producer and makes an excellent living fence.

Desmodium ransonii

It is a very popular tree which is very effective when planted as pure stand.

Planting

D. ransoni can be established from cuttings or from seeds. The seeds should not be pretreated and care should be taken not to cover the seeds with much soil.

It is ideal to plant within all hedgerows as it seeds heavily and thus helps to fill in gaps.

Harvesting

It produces a large volume of fodder bio mass with a faster recovering rate especially during the wetter months.

Sesbania (*Sesbania sesban*)

It is very tolerant to water logging and even grows in the water on lakeshores. It has adopted nodules which are in the air above the water. It is also drought tolerant.

Planting

The seeds can be planted directly or soaked overnight to improve germination.

Harvesting

When harvesting it must not be severely cut back below one and half meters.

It is not quite as long as the mentioned above three.

Flemigia (*Flemigia macrophylla*)

The tree's good characteristics is that of producing many shoots coming up from one rootstock thus aiding in filling in gaps and is ideal for contour lines.

Planting

The seeds should be soaked overnight prior to planting.

Harvesting

It provides fast re growth in a variety of climatic and soil conditions being especially encouraging for a dry land farmer.

Feeding

It is highly palatable but should not exceed 1/3 of the total daily cow ration.

Calliandra calothyrsis – Red

Calliandra tetragona – White

Is similar to *leucaena* and even resembles it. Its fodder contains tannin which causes it to be both less digestible and palatable. It produces much bio mass matter and it is excellent as mulch or green manure if not utilized as fodder.



Planting

Calliandra seeds should be soaked overnight before planting.

Cajanus cajan pigeon pea.

It is a short lived fodder tree which has the advantage of being dual purpose human and livestock food, and establishes easily.

It is ideal to plant together with slower establishing fodder trees to get a fast crop the first year before it may be slowly eliminated by longer lived tree varieties.

How to maintain harvest and use fodder

Fodder is planted, maintained and harvested to appropriately do this some key principles should be followed:

- It will eventually be necessary to replant fodder in the soil to renew it when root bound and to aerate the soil. The care used to maintain and harvest fodder usually will determine the time before it will need replanting.
- Follow good advice on harvest and maintaining fodder by learning from local conditions what works best as well as knowing and following the correct harvesting method for each fodder.
- It is usually advisable to do mixed cropping to maximize the ground cover so important in the subtropics/ tropics and to enable the legume to provide some nitrogen for the companion plant.
- Use or store the forage when it is in its optimum state of nutritive value balanced with its optimum volume, because when cut too young, it will set back its rate of regrowth and if it matures beyond an optimum state, its growth again becomes slower. You may need to learn these times based on local conditions, or from advice of a livestock officer.
- It is important to return something back to the soil. Not merely to harvest and take away from the field. Crop residues should be incorporated or lie as mulch rather than be burned or removed. This include slashed or uprooted weeds.
- As plants grow many essential nutrients are removed from the soil which need replacing. Farm yard manure is a nearly complete fertilizer containing among other nutrients the three major elements nitrogen phosphorous and potassium. It improves the texture of soils by increasing the content of humus, the dynamic biomass which increases soil fertility and structure.

Poisonous plants

Plants cannot move to escape their predators so they must have other means of protecting themselves from herbivorous animals. Some plants have physical defenses such as thorns spines and prickles but the most common type of protection is chemical. Some plants have evolved the means to produce a vast and complicated array of chemical compounds in order to deter herbivores. Poisonous plants pose serious threats to domestic animals when eaten mixed with rations.

Poisonous plants are so numerous, a few of them have been listed in the table below:

Table 2

No	Name of Poisonous plant	Sign of Poisoning
1	Cassava peels	Frothing dizziness, ataxia - Death
2	Sudan grass	Frothing (foam from the mouth)gaspings convulsions - death from respiratory paralysis
3	Young sorghum plants	
4	Lantana spp. Leaves and feeds	Frothing, muscles tremor dizziness - death
5	<u>Solanum incanum</u>	Muscles tremor, staggering gait lateral recumbence, leg paddling movements - death
6	Datura - seeds and flowers	Painful photophobia, tachycardia, mydriasis
7	argemone	diarrhea
8	oxalis	diarrhea

Control of poisonous Plants

1. Weeding them out from posture plots
2. Manual removal from feed rations
3. Fencing areas with poisonous plants.
4. Wilting of pastures before feeding
5. See a Veterinary Doctor for advise.



Datura



Indigofera



Lantana



Argemone



Oxalis

Environmental Conservation

One of the greatest problems farmers are encountering is the degradation of the environment in slow and sometimes subtle ways which is evidenced by reduced crop yields, changing climate patterns and the general health of livestock.

Of late environmentalists have been unjustifiably accusing livestock as a source of environmental degradation. However these allegations are not true. The truth of the matter is that livestock plays a major role in environmental conservation when appropriate and environmentally friendly methods are adopted to raise them. One of the environmentally friendly methods is zero grazing / stall feeding method.

How zero grazing enhances environmental conservation

- Appropriately built according to recommended dimensions cow shed will enable the farmer to easily collect manure for farm application.
- Plant fodder grasses or, more importantly leguminous fodder trees on contour bunds preserve the soil and water through the land holding.
- Planted pure stand of leguminous trees as a small forest fodder bank and / or live boundary to your farm, provide fodder for your cows and building materials for future farm structures. Besides these will improve the micro climate, draw up nutrients from the subsoil, increase nitrogen in the soil and perhaps most importantly provide high quality mulch.





TOPIC NO. 4: FEEDING A DAIRY COW

A dairy cow transforms ingested green feeds (grass and legumes) into milk. The feed ration given to a dairy cow should contain all the required nutrients for maintenance, production of milk and reproduction.

A dairy cow require five main groups of nutrients viz water protein minerals vitamins, and feed carbohydrates

Water

Comprising 50 -80% of a cow's body depending on age, water is the single most important dairy nutrient. The amount of water taken by a dairy cow varies according to the type of food ingested and climatical conditions. If a cow ingests lush pasture the amount of water required reduces as compared to when the same animal ingests such roughages as hay.

It is important to note that cows heifers and calves should have access to clean cool water all the day long. If not they must be watered at least three times a day.

Cows require at least 60 litres of water/ heavy day and may need even more depending on the quality of milk yield.

Feed Carbohydrates

60 -80% of energy cows require to power all their bodily functions comes from feed carbohydrates. Grass forms the main source of feed carbohydrates to a dairy cow. Others include energy supplementing concentrates bran (maize or wheat) molasses and crop residues.

Proteins:

Proteins are essential to every aspect of body maintenance, reproduction and milk production. The main source of proteins to a dairy cows comes from leguminous plants (herbaceous and fodder trees) concentrates like cotton and sunflower seeds cakes. Urea when fed in recommended proportions can be a source of proteins.

Minerals

Minerals are inorganic compounds needed for a whole host of regulatory and structural functions in the cow. Lack of minerals can cause such metabolic diseases like milk fever infertility, and reduced milk production.

Minerals are available in green feeds but not in adequate amounts. Hence it is advisable to supplement a dairy cow feed with such mineral supplements as lick stones.

Vitamins

These are organic compounds needed in small amounts for a variety of chemical reactions in the body. Fresh, forages are a good sources of fat soluble vitamins, but dried stored and ensiled forages have little vitamin content remaining, so feeds based upon them must be generally supplemented. The most required vitamins include such vitamins as A, B,D and E.



How much to feed a dairy cow

As a general rule fodder must be ever present in front of a cow; to eat as much as she will. This is especially true to milking cows.

The amount of fodder required per cow per day depends on the size of the cow whether during rainy or dry season. The table below shows fodder requirements during the rainy and dry seasons and according to body weight.

However you are not advised to limit the feeds to the designed table nor you should not fill the feed through wastefully even if what is given is not fully finished by the cow.

Table No.3

Cow size	Amount of fodder fed during		Together with concentrates x kg
	Rainy season (kg)	Dry season (kg)	
Large size cow	80 - 120	65- 80	5 - 8
Medium size cow	50 -80	40 - 65	3 - 4
Small size cow	30 - 50	25 - 40	1 - 2

Feeding concentrates

Cows and lactating heifers should be fed concentrates (dairy meal) in the ratio of 1 kg concentrate per 2 - 3 litres of milk. Thus for a cow to produce 10 L of milk per day she should be fed 3 - 5 kgs concentrates per day using dairy meal.

A heifer in first lactation should be fed concentrates in a higher rate than other cows in order to allow growth. After calving the cow should always be fed a little concentrates than her milk yield justifies in order to encourage milk production to rise during the first part of the lactation. This extra concentrate feeding should continue about 3 weeks.

NB

At certain point an increased level of concentrates will only fatten the heifer or cow if she is already producing up her physical ability.

Over fat dairy cattle may deposit fat in their udder tissues, which physically can limit milk production ability.

Making a dairy meal concentrate

The makeup of a dairy concentrate is usually from three general types of ingredients; a high energy source such as maize bran rice wheat or other grains; a high protein source such as the oil seeds cakes viz, cotton sunflower etc. and a mineral salt mixture. Relative proportions are described below



Table No: 4

Dairy meal ingredients	Quantity in proportions
• Bran (maize rice, wheat or other grains)	3 units
• Oilseed cakes (cotton, copra, and sunflower sesame soya beans.	1unit
• Mineral/ salt mixture	1/10 of the unit
• Regular ground salt	1/10 of the unit
• Lime	1/10 of the unit

Making of a mineral supplement concentrate.

A small scale dairy farmer can compound a mineral supplement concentrate from the following ingredients

- Regular table salt
- Ground after burning bones
- Trace mineral mix

This type of mineral concentrate mix is usually cheaper and can be affordable to a small scale dairy farmer. The only bottleneck is that the work involved can be laborious and at times tiresome. 20 – 100 grams of the mixture can be fed to an animal per day.

Recommended Mineral and Salt Levels

The daily supplementation of 20 -100gm of mineral mix and an equal amount of salt may be adequate depending on size of animal and feeds being used. However 10 litres of milk contain about 100gms of minerals. If the cow cannot get it from her feeds she will consume her natural reserves. Some farmers feed a powdered mineral mix which includes salt “ad libitum”. It is unusual for any animal to consume more than it requires although it may at first consume a high level, it usually balances off within a short period of time. Mineral lick stones normally are in short supply of such macro elements as phosphorous and calcium. It is better to supplement cows with mineral mixtures rich in the two microelements together with the lick stone

Molasses - Urea - Mixture

The mixture is usually supplemented to a ration of grass as an energy protein concentrate. Nitrogen element which is in urea compound microbes and ultimately is used in the making of proteins.

NB

Molasses urea mixture should not be fed to suckling calves or in large amounts than it is recommended by livestock officers.

Feeding using Molasses - urea - mixture

- The mixture can be fed in form of a mineral block
- By sprinkling the mixture on dry forage

NB

The mixture should not be mixed with water as in so doing a certain amount of nitrogen from the mixture will evaporate into the air.



When water mixes with urea a certain amount of ammonia gas is formed which together with nitrogen which is an element in the ammonia compound evaporates.

Relative proportions of Molasses - urea - mixture feeding are shown in the table below

Table No: 5

Category of animal	Molasses - urea mixture per day (kg)	How to feed (kg)
Adult cows	2	1 kg in the morning 1 kg in the evening
Yearlings and heifers	1	½ kg in the morning ½ kg in the evening
Weaners	1/2	¼ kg in the morning ¼ in the evening

Molasses - Urea - Mineral Block Recipe

Table No.6

Ingredients	Ratio	For example
Molasses	35%	35kgs
Urea	Not to exceed 15%	15kgs
Bore meal / mineral mix	2%	2kgs
Salt with/ without vitamins	5%	5kgs
Cements or Bentonite	Not to exceed 13%	3kgs
Fine ground wheat or rice	30%	30kg
Total ingredients	100%	100kg

Dry Season Feeding

The high growing grass and fodder trees, usually remain the highest value feeds for the dry season.

Elephant grass loses quality before guatemala grass and Setaria. leucina and sesbania show better regrowth in the dry season than the other popular leguminous fodder trees and can be budgeted for use more during this time.

- Forage for dry spell feeding can be conserved in the following forms
 - Hay
 - Silage
 - Farm residual crops.

Hay making.

Hay is fodder, which has been dried and stored with out further processing. Hay when well dried can be stored indoors and fed to cattle in the dry season when food is scarce or to give balance to ration which is otherwise very high in water such as overly lush growing fodder in the wet season.



Grass to be made into hay should be cut prior to the flowering stage in order to obtain the highest feed value. After cutting it should be dried if possible in the sun being turned so as to evenly dry but not overly dried. A day or two for the finer grasses and more for the high growing. After drying hay should be stored preferably indoors where it will not become damp or contaminated.

Silage Making

Silage is fodder preserved without drying by an anaerobic process which ferments it keeping most of the nutrients intact. It is slightly higher in feed value than the same fodder dried as hay.

Silage can be made from excess fodder which normally is produced during the wet season or from a wide variety of lush growing farm crops such as sorghum maize or most types of legumes and grasses.

Maize or sorghum should be cut for silage when grains are still soft and milk and grasses should be cut or flowering stage, when they are richer in protein minerals salts and vitamins.

NB:
When making silage from sorghum special care must be taken that the crop is not cut earlier than the flowering stage or during a drought, when the content of prussic acid may be high enough to poison cows.

- It should be noted that silage preserves but does not necessarily improve the quality of fodder being ensiled.
- Most spoiled silage results from faulty methods;

Good silage results from heeding the important steps, especially three important conditions:

- (i) The crop must be harvested and ensiled quickly. It needs to be packed so that air cannot remain in the silage hole or trench and no water should be allowed to enter it from rain or from the ground.
- (ii) Silage can be made in a hole or trench. The trench should be dug in the ground which is well drained such as a hillside. The size of the trench can vary according to amount of silage needed or amount of excess fodder available, the floor and sides should be covered with banana leaves or plastic material, so as to minimize the amount of spoilage caused by contamination with soil or soil mixture.
- (iii) A drainage ditch should be dug on the upper side of the trench to prevent any water runoff from entering it at any time.

Before placing the fodder into the trench it should be chopped small if at all possible which makes compression easier and the exclusion of air more effective. If air is not excluded the silage will rot, and become useless as cattle feed. Alternately the fodder can be carefully placed in parallel orientation until the trench is filled continually being well packed.

The trench must be filled with fodder material in as short a time as possible. While filling walk around on the chopped fodder in order to compress it. If you can get some molasses mix it with the fodder while filling the trench as it will enable a rapid fermentation to take place and thus better ensure a good product.



- (iv) When the trench is full, cover it with pieces of banana leaves or plastic material and then cover it with a layer of soil so as to make sure air cannot enter it. Soon after covering the trench juice may start flowing which is very normal. Silage will be ready after 1 to 2 months but can lay untouched for a long period.

A good silage will have the following qualities:

- Should be yellowish green to light brown in color.
- Should have a sharp but pleasant smell.
- Should not be contaminated with soil.

Bad silage will have the following features:

- Pungent smell as a result of rotting.
- It will be Black and white color.
- It will be highly contaminated with soil.

How to treat stover or straw with urea

Dried corn, millet, and sorghum stovers, sugar cane tops or barley straw have low nutritive values, if fed raw as they are, but can be improved considerably in quality and digestibility; by first treating them with a three week fermentation using water- urea solution. This is because the urea in small amounts can be converted into protein by micro flora of the cow's rumen and the lignin in the Stover/straw breaks down somewhere by being moistened from the urea-water mixture.

Because urea is potentially poisonous it is important that the following steps are followed carefully so as not to take chances:

1. Prepare a trench identical to the one used for silage including lining it with plastic or banana leaves on the side and floor.
2. Since the mixture does not store indefinitely like silage make only enough to utilize for three weeks at a time.
3. The treatment is more successful if the stover or sugarcane tops are chopped small to aid infiltration of the urea-water solution and improve packaging it in the trench.
4. Mix 1 kg urea 46% with each 10 litres measure of water. You will need 10 litres of water for each 16-20 kilos of Stover/straw. Because you will now be filling the trench with Stover/straw in layers and then sprinkling the solution over each layer, you can continue to make more of the urea-water solution as you go along making sure that the solution is adequately mixed each time so that the granules are completely dissolved.
5. Fill the trench with moistened straw/stover and cover it immediately with plastic material or banana leaves and then soil to keep out air and reduce evaporation of both water and Nitrogen from urea.
6. After three weeks it is ready to open from one to end. Feed after 24 hours.

CAUTION: *This mixture should not be fed to calves, immature ruminants or non-ruminants.*

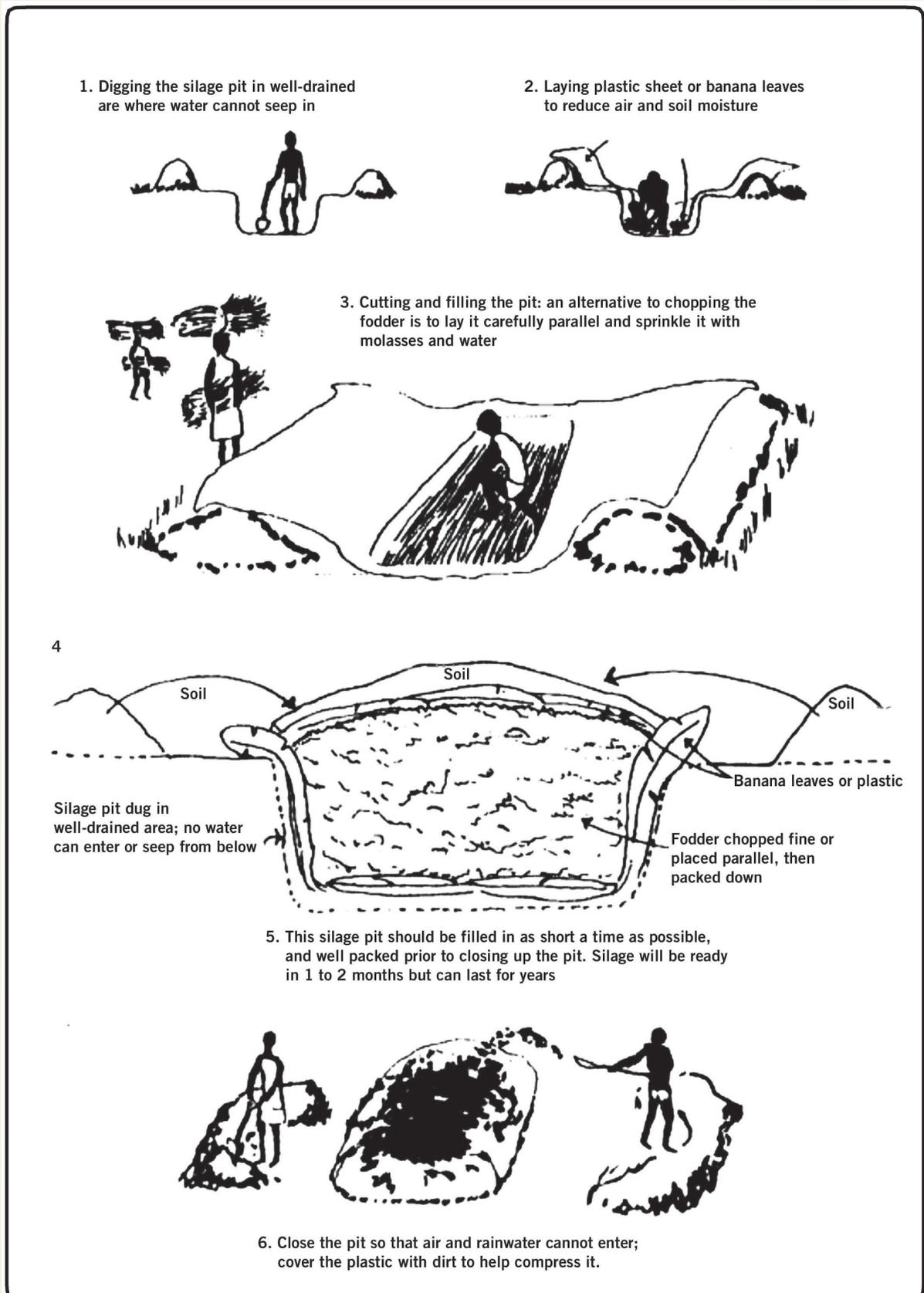
Field residues accepted as forages

Almost everything brought from the field is potential filler for the cow during the dry months, although the value is quite variable.

The following are typical field residues listed in order of their importance or feed value; sweet

potato vines, bean groundnut and other legume straw, avocado, guava and mulberry leaves, banana tops and stalks, wild grasses and other edible by cow's weeds.

Silage making





TOPIC NO.5: MANAGEMENT OF DIFFERENT GROUPS OF A DAIRY HERD

Introduction

The management of different groups in a dairy herd depends on the age category, level of milk production and stage of pregnancy of a dairy heifer or cow.

- A dairy herd can be categorized in to 5 groups:

- (1) Heifers
- (2) Lactating cows
- (3) Calves
- (4) Dry cows
- (5) Breeding Bulls

1. Heifers:

A heifer is a female cow between 12 months of age and first calving. Replacement heifers are the foundation of a dairy enterprise. Improvement of a dairy herd is possible when culled cows are replaced by well-fed healthy, genetically superior and properly managed heifers.

Management of Heifers

Heifers should be provided with good Quality fodder, adequate clean water, salt and mineral and concentrate during the first six months of life and two months.

Prior to calving

- A strict vaccination regime should be adhered to.
- Should be periodically dewormed.
- Should be sprayed against ticks and other ectoparasites.

The danger of low level feeding to immature heifers

If heifers are underfed during the growing period, weakness are often created. These eventually tend to reduce milk production potential though poor feeding.

Growth rates are governed primarily by the quality and quantity of feed which the young heifer receives, but the ultimate size is primarily genetically controlled.

A poorly fed heifer will appear “leggy” and shallow bodied with a small pelvis and narrow lean frame. She may tend towards infertility and have difficulty in future calving.

When should heifers be bred?

A pure bred exotic heifer can grow large enough to be bred at the age of 18 months under good management. Crossbred heifers tend to take longer as well as poorly grown heifers. Recommended age at mating depends on the way heifers are raised and their breed type.

Table 7: Breeding weights recommended for various breeds of dairy cattle.

Bred of cattle	Weight in kg
-Frisian, Friesian Boran crosses, Brown Swiss	300kg
-Ayrshire, Guernsey, Sahiwal, Friesian x Zebu cross	275kg
-Jersey crosses of smaller breeds	250kg



- It is sometimes recommended to use bulls from smaller breeds on heifers of any breed to avoid calving difficulties for the first time. Subsequent breeding can be done within the breeds in order to develop pure lines of cattle.
- It is Important to keep properly the breeding dates records, pregnancy diagnosis should be done preferably 3 months after the dam has been served.

Observation for repeated heats is very important just as keeping records of breeding dates.

Management of a pregnant heifer

The gestation period for a cow is 275-280 days. 2-3 months before calving heifers, should receive improved fodder and should be “steamed up” with concentrates beginning one month prior to calving to ensure a healthy calf, to be able to with stand diseases and to induce milk let down leading to increased milk production later.

CAUTION:-

Pre milking is not recommended. Gently palpating the heifer's udder starting a few weeks prior to calving is a good way to accustom to the human hands. However you must not squeeze the teats which are seated with a natural plug, which prevents bacteria from entering into the udder. When you begin milking you remove this plug, and once you have begun milking before the calf is born, there will be no colostrum, the important first milk for the calf when is finally born.

Pre milking is advisable only in extreme cases of udder swelling close to calving time.

Management of a lactating Cow

A lactating cow should be given good quality fodder, clean water minerals and concentrate so that she can attain her production ceiling during the second to the third month of that lactation cycle. Shed sanitation should be given maximum attention to control such diseases like mastitis and calf scour.

Calf Rearing

The newly born calf requires its mother's first milk called colostrum immediately after birth and for the first three to four days. Colostrum is highly nutritious rich in vitamins and minerals and antibodies which give the young calf resistance to various diseases. For the first 24 hours it is wise to let the calf remain with its mother and after that colostrum and subsequent feedings may be fed from a clean bucket.

Table 8: Amount of milk volume Recommended for calf feeding on daily basis:

Weeks old	Litres of milk			Total/Day
	Morning	Midday	Evening	
1	1	1	1	3
2-3	1.5	1	1.5	4
4-14	2	-	2	4
15-18	2	-	1.5	3

A vigorous newborn calf usually struggles quickly to its feet and within a short time finds its way to its mother to start suckling.

If it seems unable to find its way or the cow resists being sucked you should help the calf and if necessary restrain the cow with legs tied in order to let the calf suckle its mother.

Feeding of the calf

Two ways of feeding the calf are known:

- (i) Letting the calf start suckling before hand milking begins or follow afterwards but before milking is finished.
- (ii) Feeding in a clean bucket to ensure that an exact amount is fed and to discourage the cow from withholding milk if the calf is not present.

Letting the calf suckle directly from the mother either before or after milking

This method has advantages over bucket feeding and is recommended if the milk is periodically measured to ensure that the calf is getting enough by milking the cow out occasionally to know what proportion of the total milk the calf is getting.

Advantages are that the milk stays clean at a constant temperature and may stimulate the cow to give more milk. The cow may also suffer less mastitis by the fact that the calf may completely extract all the milk. However care must be taken that the calf does not get too much or too little milk.

Feeding in a clean bucket

These methods ensure an exact amount of milk is fed to the calf. Disadvantages to this system are related to poor sanitation and irregularity in feeding of the milk which may lead to diarrhea (scours)

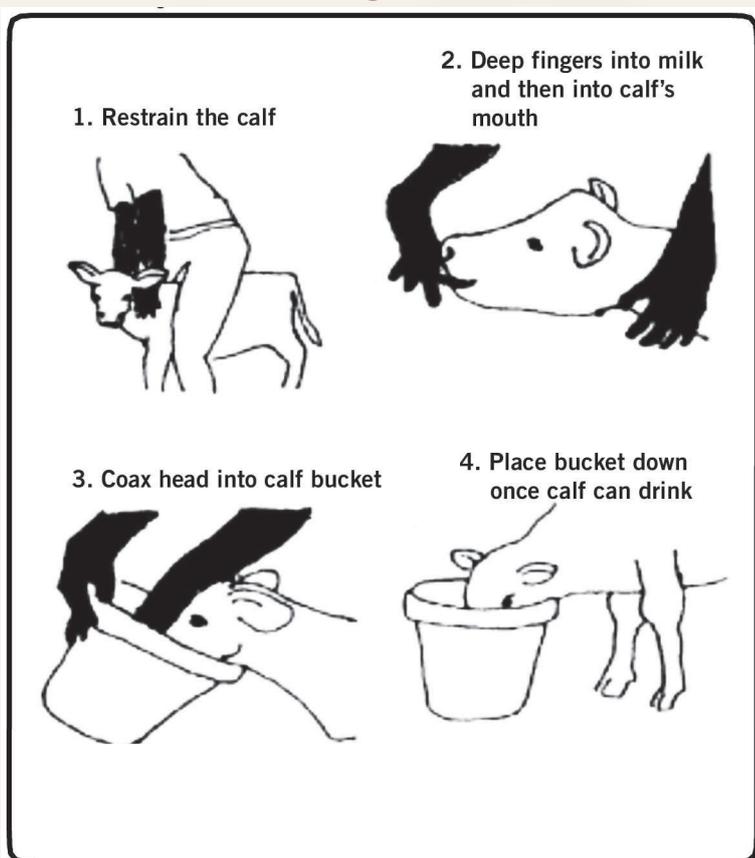
How to teach the calf to drink from a bucket

The calf should be restrained firmly between your legs. Dip your clean hand into the milk then entreat the calf to suck your two middle fingers by working them into its mouth.

- Hold the bucket off the ground and the calf should drink readily.
- Do not try to let the calf drink with its head down at first so that it cannot gulp the milk too fast.

If it drinks so fast milk may enter the lungs and cause coughing more so it will be prone to diarrhea from incomplete digestion.

Feeding the calf





Fostering a calf after death of cow mother

If the cow mother dies before the calf has received colostrum and if it is available from another cow it is important that it should be acquired and fed.

If it is unavailable the following substitute can be fed:-

Recipe for colostrum substitute

- 1 fresh egg
- 1 litre of clean warm water
- 1teaspoonful cod liver oil
- 3 teaspoonful castor oil

Mix it well and feed to the calf three times a day for the first four days, then continue with regular milk or milk replacers.

Feeding of a calf up to weaning

A supply of clean fresh water should be constantly in front of the calf after two weeks of age when it starts eating a little hay or soft grass. Concentrates can begin to be given at this time and increased as the appetite grows up to 1kg per day, salt and minerals in small amounts should also be provided either in from of powder mixed in the concentrates or as mineral blocks.

Calves that are eating dry feeds are less likely to suffer from diarrhea than those fed entirely on milk. It is therefore desirable to induce calves to eat dry feeds as desirable to the second week from birth. You may encourage the calf to eat concentrates by rubbing a little of the concentrates on its nose or putting a small amount in the bucket just before the calf has finished its milk.

How to prevent calf scours

- Changes in a calf diet should be made slowly as sudden changes may cause scours.
- Feeding times should be the same either cool or lukewarm.
- Milk should be fed immediately after milking to prevent the buildup of harmful bacteria.
- Cleanliness and sanitation are important to prevent scours.
- It is also important not to overfeed the calf with milk.
- The feeding bucket after being washed should be inverted in the sun for sundrying, stored away and not be used for anything except feeding calves.

If the calf begins to have scours immediately stop feeding milk until it has recovered. Replace feeding of milk with:

- Frequent feeding of warm clean water with salt and glucose added if available at a dose of 1 teaspoonful and 30 respectively.
- Do not feed sucrose (normal table sugar) in place of glucose. It is not easily digested by calf and may make matters worse.
- It may also be advised to treat with antibiotics unless the sure cause of scours was over feeding of milk.

Dried cows

Drying up a cow means stopping milking. It entails resting the cow for (60 days) prior to their next calving date. If the cow does not have a dry period between lactations its subsequent yields will be reduced. The dry period allows the udder to rest and the cow to become strong again to build up a body reserve ready for the next Lactation.



Drying up a lactating cow

- If the cow is giving less than 5litres/day there is seldom a reason not to dry her off immediately when the time comes for her two months rest to begin.
- In case the milking-cow which should be dried off is giving a considerable amount of milk. She can be gradually dried off over one week by either milking her out one per day or milking her out partially to relieve pressure within this udder.
- A first calf heifer should be given a longer dry period than a cow to enable her to grow up to 90 day, dry period is advisable.
- Cows in poor condition and undersized heifers also should be given longer dry periods.

How to feed a dry cow

During the dry period the cow should be well but not lavishly fed. Over feeding of minerals at this time is not advisable.

- She should not require concentrates until she is steamed up; 4 weeks before calving.
- If she is not in good condition she should receive improved , concentrates and minerals during her dry period to enable her to give birth to a strong healthy calf, with stand post calving problems, and have reserves to be able her to produce lots of milk.

Bull Management

- Maintenance of a breeding Bull requires good feeding housing and general management.
- As with a heifer calf a good diet for the young bull calf and proper treatment as he develops are foundations of a long useful life.
- Regular exercises each day, if the calf is reared indoors helps to strengthen the bull.
- Regular handling helps to tame him preventing him from being temperamental later.
- Undue confinement with inability to see or take part in the activities of the rest of the herd may lead to depression and loss of libido; the active urge which a bull needs so as to be a successful breeder.

Age at which the bull can start serving heifers

- At about 10 months of age although the bull may show the ability to be sexually active, to allow the young Bull to begin at this age is too risky.
- At 10 months the bull is already fertile but it is best to wait until he is 18 months old.

How many bull services per week and per cow are recommended?

- As a general rule is to allow one service per week until he is two years old and then two per week for the next 6 months.
- Afterwards consider three times a week or up to 150 matings per year.
- It is sometimes recommended to allow a bull to mount a cow more than once to increase the chances of conception.

Qualities of a good Bull

- 2 symmetrical testicles dangling between his hind limbs.
- A straight penis
- Strong hind limbs
- Should come from a high pedigree line
- Should have libido



TOPIC NO. 6: BREEDING

Introduction

The most important and most frequently missed opportunity for dairy farmers to become successful and prosperous, is in the detection of oestrus (heat) and subsequent bleedings, in order that cows become pregnant again, as soon as 45 days after calving if possible and hence getting an offspring every year.

What Is the best time to serve?

It is best to breed animals in the latter stage of heat when conception is more likely. Therefore;

- (i) Cows first seen in heat in the morning should be inseminated/bred in the afternoon/evening; of the same day.
- (ii) Cows first seen in heat in the afternoon/evening should be bred in the morning of the following day.

Heat Signs:

- Cow bellows, smells other cows, ears are alert, stops eating, less milk is produced. The sign is seen during the first 1-6 hours.
- Cow mounts other cows and stands when mounted. The vulva is swollen the sign is seen during the 6th-9th hour of heat.
- A clear mucous discharge comes out of the swollen vulva. This period is termed as the end of standing heat period. , it comes within 9-20 hrs. of heat. **IT IS THE BEST TIME TO BREED.**
- Cow no longer stands to be mounted. There is a dry mucous at tail.
- Some female cows will discharge blood after 28hrs of the heat period. This is an Indication that **IT IS LATE TO BREED.**

The cows reproductive system produces an Ovum her egg which is released about 12 hrs after she has gone off heat when it travels down the oviduct taking another 6 hours. If the cow is served when she first shows sign of heat the bull's sperm will have to remain within the cow for about 30 hours before it meets the own in the oviduct. By these the sperm will be inactive and conception may not take place at all.

NB:

- *Cows first seen in heat in morning should be bred in the evening.*
- *If seen in heat in the evening should be bred in the morning.*
- *Cows will normally Cycle in 18-21 days.*
- *Breed heifers when they are 18 month and above and have attained at least 270 kilograms and above of weight.*

How soon the cow should be bred after calving

It is advised that cows should be bred between 45 to 90 days after calving. Breeding on or about the 85th day, results into a calving interval of 12 months. It is more difficult to get cows in calf if they are not served at the heat period that occurs approximately 45-50 days after calving.



Breeding methods

Two major breeding methods

- a) Natural
- b) Artificial Insemination

The Natural method of breeding makes use of the bull; it is the most commonly used method by small scale dairy cattle farmers.

Artificial Insemination is by far the most economical method by the farmer to obtain improved dairy calves.

Merits of artificial insemination

- It is cheaper in comparison to keeping a bull.
- AI uses semen from selected high quality (pedigree) bulls.
- AI allows the use of pure bred dairy bulls of predictable value which may not be physically available in the area.
- By using AI such contagious diseases as brucellosis cannot be transmitted from the bull to the cow.
- AI as it is the case for natural mating produces the same number of male and female off springs.

How can I predict the date of calving

Cows generally carry a calf for 275-285 days a period of time called the gestation period. Therefore it is Important to note down the dates of breeding, especially the last breeding to determine the expected date of calving.

NB:

A simple way to do it in your head is to add 9 months and 10 days. For example if the cow was bred on June, 11th by adding nine months and 10 days you will get March 21st of the following year.

Causes of infertility

- The most common reason cows may end up not conceiving is poor nutrition. Usually lack of energy proteins but also minerals.
- Improper heat detection.
- Infection in the female reproductive heat.

NB:

If the cow continues to cycle or has not conceived call a qualified Veterinarian or Livestock Officer to attend to the case.

TOPIC NO. 7: CALVING DOWN (PARTURITION)

The gestation period of a cow ranges from 275 to 285 days. In most cases births are normal and should proceed without assistance or disturbance by anyone. However it is wise to be on hand in case of any complications

Signs of calving

- The cow shows uneasiness lying down and rising again and walking with difficulty
- Her vulva will have swollen and begun to discharge mucous.
- The ligaments on each side of her tail head will loosen as she begins irregular straining, she often glances backward.

One or two hours before the curtail calving a “water bag” usually appears filled with amniotic fluid which assists to dilate and lubricate the passage way through which the calf will pass.

Normal Birth

During normal unassisted calving two feet should appear before two hours have passed since the water bag appeared, followed by the nose and within one hour the whole head. Within minutes the shoulders and finally the entire calf will quickly be thrust out.

When Is help necessary during calving

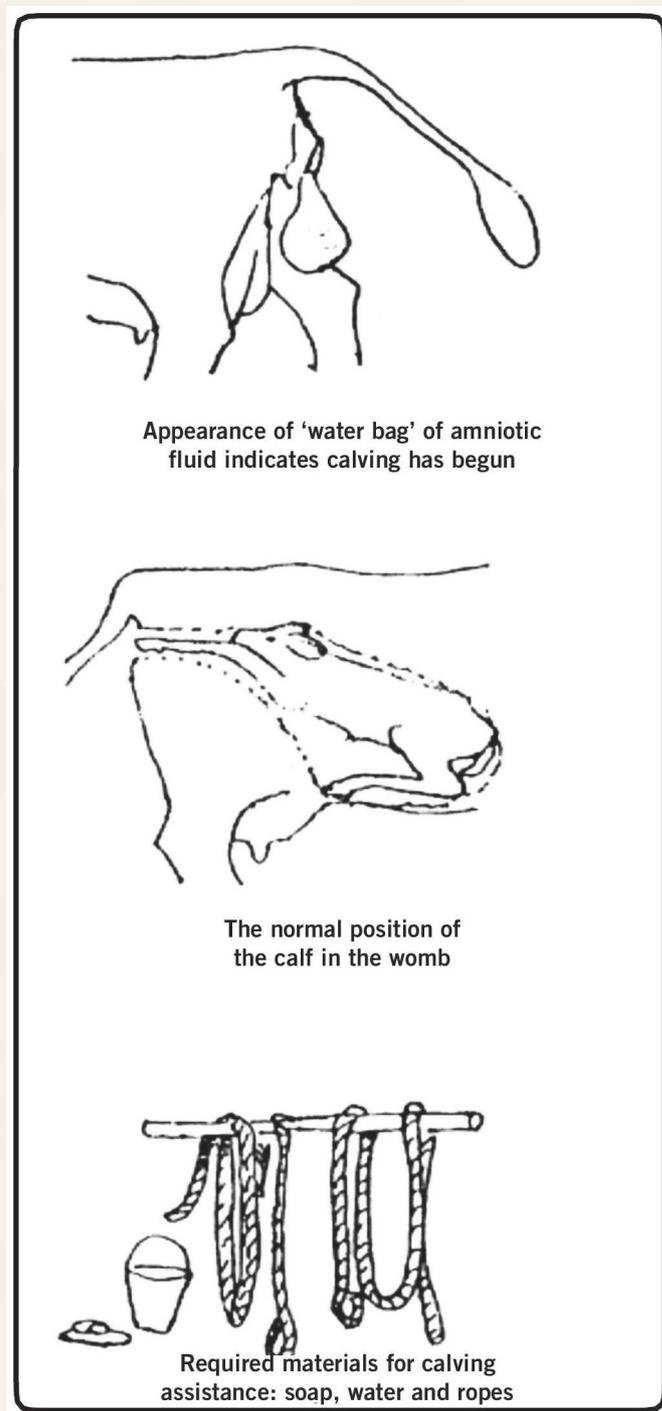
There can be many situations which make calving difficult or impossible without assistance. In general if a calf is not born within two hours from the first appearance of the water bag or after two hours of regular straining you may expect some problem.

NB:

If the dam experiences problems in calving it is advisable to get the help of a veterinarian or a livestock expert.

If a Vet or a livestock expert is not around then the following can be done;-

- 1) Clean your arms with a disinfectant and cut the fingernails short.
- 2) Try to avoid infection by using clean washed ropes or calving chains lubricated with plenty of soap or disinfectant.



Appearance of 'water bag' of amniotic fluid indicates calving has begun

The normal position of the calf in the womb

Required materials for calving assistance: soap, water and ropes

- 3 Try to determine if the foot that might have appeared belong to the same calf and not to two different calves and if they are either both front and rear feet.

NB:

When Front legs present themselves first (Normal Presentation) the dew claws point downwards, whereas when the rear legs present themselves first the dew claws usually point upwards.

- 4) Any pulling of the calf unless the cow is exhausted and his stopped straining should be in the rhythm with the natural contractions of the cow.
- 5) When help is needed not too much time should lapse before help is given. Get the calf out as soon as possible, and get the cow up immediately after birth so as to avoid calving paralysis.
- 6) When hands or ropes have been inserted into the cow she should be treated with antibiotic pessaries or injection to avoid infection later.

Helping a calf which is not breathing after birth

As soon as the calf is born, the following should be done.

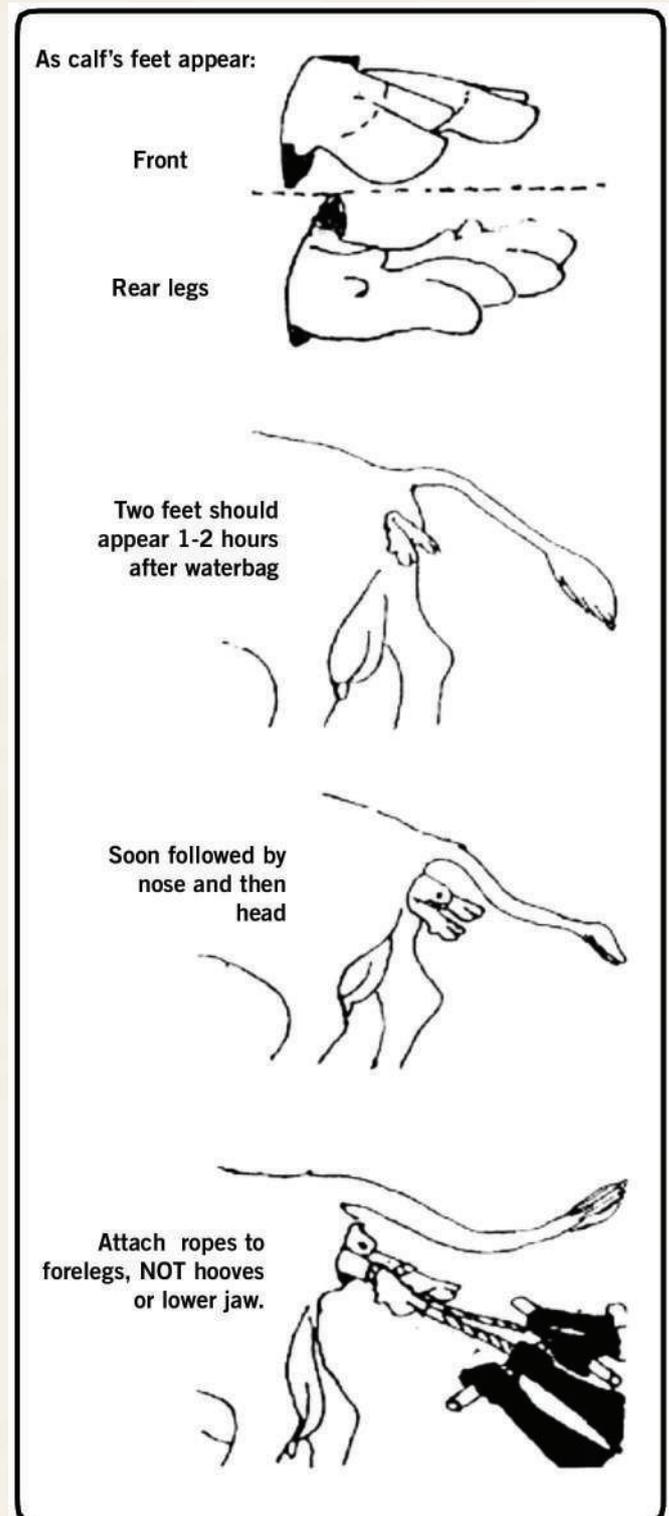
- Remove the pieces of after birth from the nose and mouth of the calf.
- Pull the tongue forward making sure that the calf can breathe normally.
- If it does not then, splash a bucket of cold water over the calf's body
- If the calf still does not start breathing the chest walls should be alternately compressed and relaxed, lifting the shoulders and bent leg up and down compressing the thorax and releasing.

NB:

There is not much time to act, time is critical and your opportunities to revive a calf are very limited. Do not give up without trying them all. A calf saved is a potential milk factory saved.

Immediate Post Calving Period

If the navel cord does not sever naturally it will require cutting. Simply cut the cord with a sharp clean knife or new razor blade, then tie it about an inch from the body with a piece of thin thread which has been soaked in disinfectant or boiled. It is normally advisable to treat the navel cord with iodine solution.





Retained placenta (Afterbirth)

The after birth or placenta inside which the calf has developed is normally expelled soon after calving by contractions of the womb which squeeze out its contents including any fluids left behind.

- If it remains inside the cow or hangs partially outside it may be necessary to seek help from a veterinarian or a livestock officer for its removal.
- In some cases it may hang up for 3 days before being discharged by itself. Should this happen then call a veterinarian to insert pessaries into the uterus.

Uterine Prolapse

Sometimes after difficult calving certain cows continue to strain to expel the contents of the womb and in so doing expel part or the entire inverted womb.

This occurs more often when the cow is not lying on level ground during calving but certain cows are predisposed to doing this.

NB: Should this happen Reach for help from a Veterinarian; or livestock officer.

What to do if the cow cannot stand

For various common reasons cattle become unable to stand. Five common causes are hereunder mentioned and treatments which sometimes work.

Table No. 9: Causes Of Afterbirth Recumbence

Condition	Causes/symptoms of RECUMBENCY	Treatment Prevention
Milk fever	Calcium metabolism problems usually occur soon after calving. Lays her head back on shoulder. Death within a few hours unless treated. Recovery Immediate.	Discontinue milking until recovery Calcium borogluconate intravenous Injection
Ketosis	Carbohydrate metabolism problems, cow becomes weak wasting away soon after calving. Usually occurs with higher producing cows or cows which are not too fat.	Glucose Intravenous repeatedly until recovery. Adequate concentrate fed to milking cows.
Obturator nerve paralysis	Often occurs before calving in underfed cattle as pressure of feet pinches nerves causing paralysis	No treatment but some cows recover. Continue to keep cow turned from side.
Calving Paralysis	Occurs during difficult calving or afterward by in legs.	To exercise legs and get cow up by lifting and support.
General weakness	Emaciation weakness caused by poor fading management or by another disease worms.	Improved feeding treatment of disease.

TOPIC NO. 8: MILKING TECHNIQUE

Introduction

Milk is produced in the udder there are four quarters of the udder. A good milker can finish two quarters at a time within 4-6 minutes and thus should not take more than 10 minutes per cow. The cow emits oxytocin (a hormone which enhances contraction of the mammary gland muscles) for a brief period after milking has begun.

Recommended milk technique

- Before milking the cow wash your hands and wash the cow's udder, with clean towel preferably in warm water.
- Dry the udder with another clean towel.
- Apply milking salve on the teats.
- Test the four teats for mastitis using a strip cup.
- If there is no abnormality proceed to milk the cow using the squeezing, not pulling method.
- Do not take more than 10 minutes.
- Make sure that milk is thoroughly milked out of the udder.
- Record the amount of milk produced.
- When there is mastitis in one or more of the quarters, milk them into separate pails after completing the normal quarters.
- Milking should be done at a specific hour of the day for all days.

NB:

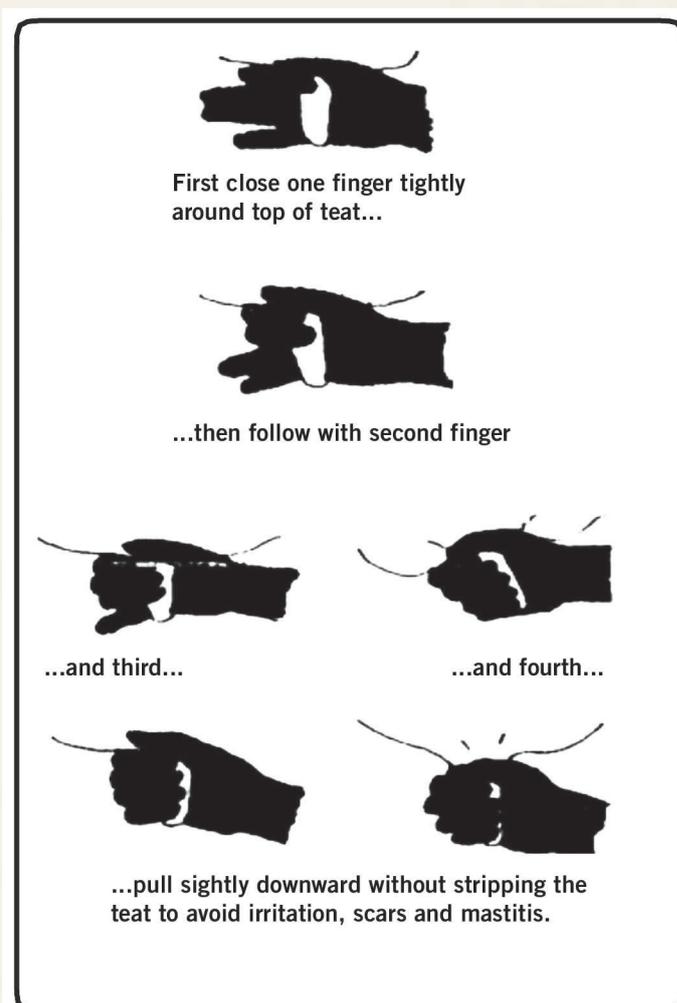
It should be mentioned that sanitation is important not only to prevent mastitis but to promote a quality product which will readily find a market and be beneficial to community. Quality milk products can be made only from clean milk. A dairy farmer is worthy of the title only if he/she has integrity and cares to produce a quality product the rest is counterfeit.

What to do If there is no milk let down or blocked teats.

Occasionally the newly calved heifer or cow will not let down milk. This may be due to her hormones which prevent it.

It may help to persist to try to milk or to bring the calf to suckle. If neither helps to release milk then see a veterinarian or a livestock officer to assist with an oxytocin injection.

- If the teats appear to be blocked also seek a vet or a livestock officer.



What affects milk production levels?

Assuming adequate feeding, health and general care are intact, you should expect the maximum milk production within a few weeks after the heifer/cow has calved and slowly decreasing amount after the third to fourth months unless you have begun to introduce improved feeding of concentrates.

The following can be impediments of high milk production.

- Poor feeding/ low quality forage feeding.
- Breed specificity.
- Poor milking techniques.
- Disease especially of the udder.
- Stages of lactation
- Productions usually increase reaching a maximum in the third to sixth lactations and then declines after seventh or eighth lactations.



TOPIC NO. 9: RESTRAINING AND OTHER HUSBANDRY TECHNIQUES

Introduction

In order to perform various treatments, routine husbandry manipulations, it is necessary to be able to restrain cattle. Methods of restraining especially physical ones should be used in a quite gentle manner to avoid exciting or hurting the animal. Chemical restraint of animals makes use of chemical compounds which can either be sedatives or tranquilizers. These can be injected by a Veterinarian.

Restraining a calf

There are two ways of restraining a calf.

- 1) Restraining it between your legs. A calf 4 months and below still possesses a small body size. Hence it can be easily and gently restrained by using two legs.
- 2) By casting it down :Hold the muscles in front of the stifle joint of the hind leg and the ones on the back of the shoulder joint of the fore limb then lift it and cast it down.



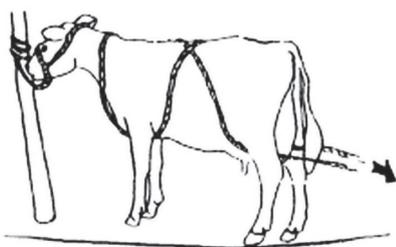
Restraining a calf



Casting down a calf



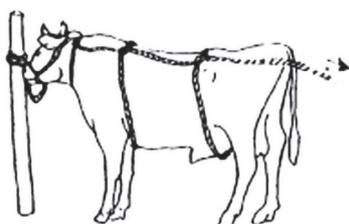
Casting down the cow, method number 1



Casting down the cow, method number 2



Casting down the cow, method number 3



Casting down the cow, method number 4

Restraining using a crush

Restraining using a crush or a stanchion makes it easier to perform husbandry manipulations to the cow.

Restraining by using a rope halter

A halter is a useful tool to lead or restrain cattle. It may be helpful when taking the animal for breeding holding it for treatments or showing it in competitions.

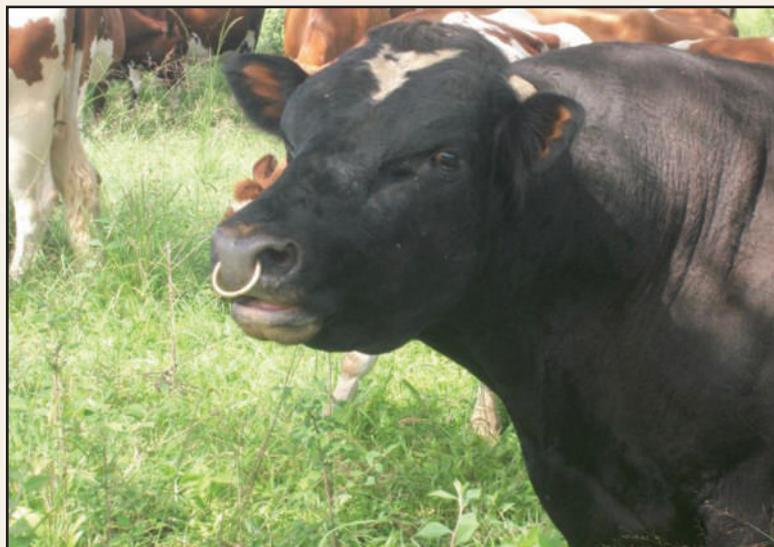
Restraining a bull by using a nose ring

The nose ring method is normally used to restrain bulls. Mature bulls can be aggressive. However when fitted with a nose ring which inflicts sharp pains on the nasal septum, the bull is restrained.

Other Husbandry Manipulations

Dehorning/Disbudding.

In order to prevent cattle from wounding one another or the attendant by horns it is advisable to



remove them by disbudding as calves or dehorning adults. It is also the least stressful if done during calf hood by disbudding. At this stage the calf can easily be restrained and healing is rapid. At 5-8 days it can be done perhaps by the simplest method by using caustic soda.

- To do it cut and shave the hair close at the points where the horns will begin growing.
- Scrap slightly the skin as well but not enough to draw blood.
- Apply a pinch of caustic Soda to each place or rotate a caustic Soda pencil at that point until a small wound has been made but bleeding should be stopped.
- If small horns have started to protrude at two to three months of age they can be cut with a super-heated knife or machete, or a hot disbudding iron can be used.

Dehorning more mature stock requires good restraint such as casting the animal and tying together the legs. The horns may be cut with special clippers or using an embryotomy wire saw.

NB: *It is advisable that both dehorning and disbudding be done by a Vet or a livestock officer.*

Hoof trimming

Maintaining sound hoof care strengthens the muscles in the leg, enables cattle to stand more erect and prolongs their useful life.

The animal may need to moderately be restrained if it is done in a calm manner. Hoof trimming is done using a hoof shear.

Castration

Bulls which are kept but not wanted for breeding purposes are usually castrated.

Two method of castration



- i) Bloodless castration, this is done at any age beyond 8 months, using a burdizzo which severs the blood vessels to the testicles causing them to atrophy.
- ii) Open method. This one involves the surgical removal at testicles. Usually best done at a young age 4-6 months.

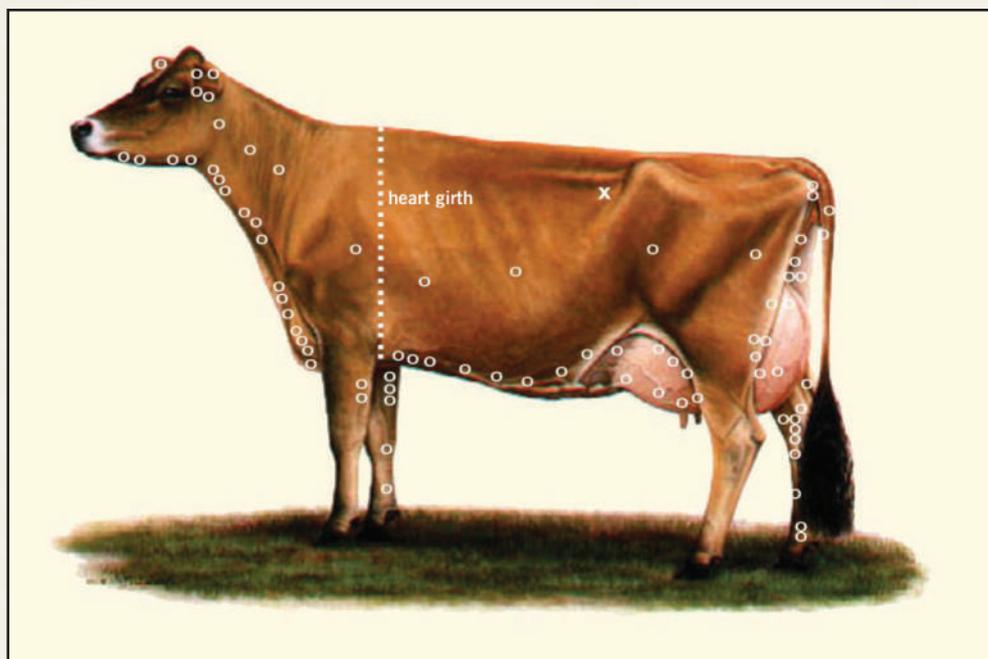
NB: These manipulations should be done by a Qualified Livestock other or a Veterinarian.

Spraying Against Ticks

- In order to effectively control ticks it is necessary when spraying that every part of the body be reached, not only the hair but the skin be moistened.
- The cattle should first be adequately restrained, the spray pump should be filled with acaricide water mixture at recommended ratios.
- It is advisable to spray cattle at a place separate from the shed, where the chemicals cannot contaminate feed or water.

Pour Ons

Pour Ons are becoming more economical which may merely be applied along the backbone of cattle from the head to the tail head. These control not only ticks but also tse tse flies.



KEY:

O - Areas on cattle where ticks are often found. Be sure to spray these areas well.

X - The area on the LEFT side of the cattle where, if necessary, it may be punctured to release air or foam in the case of acute bloat

:
: - the heart girth where the measuring tape should be drawn around a cow/calf in order to estimate weight of cattle.
:
:

- Some farmers use pyrethrum grease (py-grease) compound which repels or kills ticks; when applied to certain areas where ticks are commonly found e.g. around ears, legs and tail head.

Cattle Dips

The popularity of common dips has gone down as they require a large investment in chemicals for initial filling of the dip tank with dip wash and replenishment.

The illustration below shows where ticks are most commonly found on the body of a dairy cow.

Drenching of anthelmintics

The Administering of liquid prepared anthelmintics is called drenching.

When drenching the head of an animal should be lifted high preferably by an assistant who restrains the animal's nose.

- Insert two fingers into the mouth from the side where no molar or incisor teeth can easily bite.
- Squeeze the animals tongue down to open the mouth and then insert the bottle from the same or opposite side on to the middle at the speed that the animal can swallow.

NB: *If the animal coughs or bellows stop pouring the drench and adjust the tongue and bottle.*

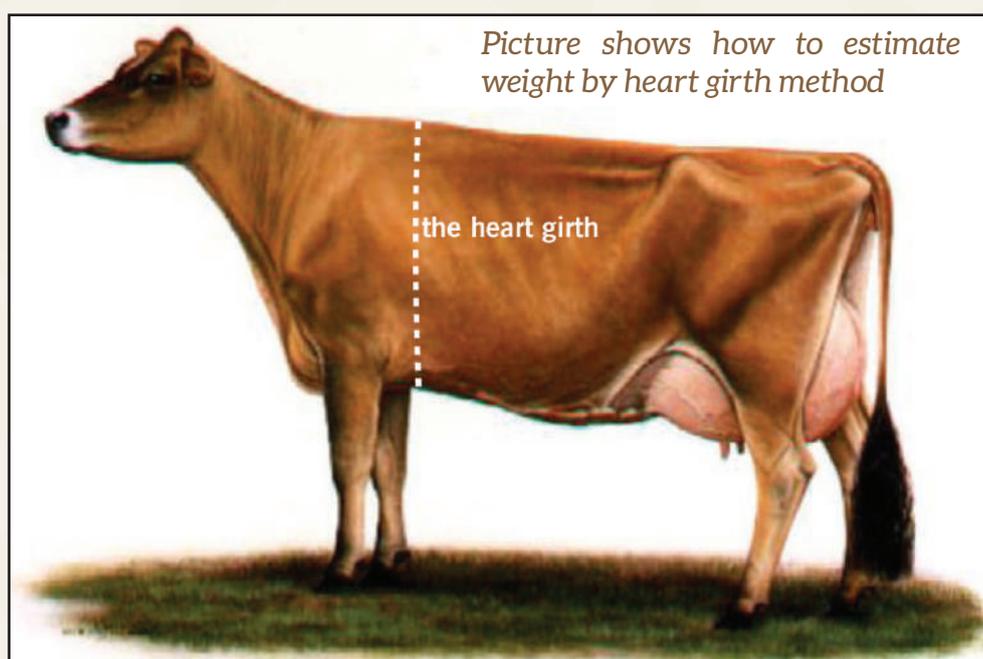
- Boli are given using special boli guns.

Weight Estimation

- It is important to know the weight of the animal as this will help to calculate dosage of drugs that are to be administered to treat disease.
- Weight is estimated by using a tailor's tape measure to measure the circumference around the heart girth.
- Weight is estimated by comparing the length of a tape measure against the corresponding weights.

Identification Methods

For proper recording of the performance of animals it is important to identify them. Several methods are used:





Length		Approximate Weight (Kg)	Length		Approximate Weight (Kg)
Centimeter	Inches		Centimeter	Inches	
65	25	35	135	54	215
70	28	35	140	56	240
75	30	40	145	58	265
80	32	45	150	60	295
85	34	55	155	62	325
90	36	65	160	64	355
95	38	75	165	66	385
100	40	90	170	68	415
105	42	105	175	69	455
110	44	120	180	70	500
115	46	135	185	73	550
120	48	150	190	75	600
125	50	170	195	77	655
130	52	190			

- Giving them names
- Ear tagging
- Branding
- Ear nothing



TOPIC NO 10: DAIRY COW HEALTH MANAGEMENT

Introduction

Healthy Livestock are not merely those free of disease, but those which are healthy enough, a condition to provide as much benefit as their potential makes it possible. Thus disease is defined as derangement of normal function of body system of animal preventing it from being productive. Therefore in this understanding malnutrition should be regarded as, a disease condition found on small holder farms but it is a major cause of other diseases which attack their Livestock.

Prevention is better than cure

- If we prevent disease we can reduce the costs of treatment and the losses of productivity and livestock deaths which diseases cause. Preventive measures are virtually all cheaper than cures, and cures are not always successful.
- However well, we try to prevent diseases they sometimes cannot be avoided; the successful livestock keeper is not the one whose livestock never get sick so much as being the one who reduces the incidence of disease, the losses which they cause and recovers from those losses learning along the way preventive measures.

Signs of diseases

After a farmer knows something is wrong, He/She should know what exactly is different. In order to help the one giving the treatment to know what is wrong it is helpful if the farmer can learn to make observations. This can be easily learned if the farmer is aware of the signs of good health.

- A description of healthy cattle should include the following:
 - General appearance - bright demeanor.
 - Normal gait.
 - There should be no obvious wounds or rashes on the skin
 - The cow should be eating or ruminating normally.
 - The muzzle should have no mucous or purulent discharges from eyes, ears, nose, vulva and other body orifices.
 - The Rumen should show some movements two or three times a minute
 - The udder should not be swollen irregularly.
 - The Animal should be able to freely urinate a clear yellowish urine, and the faeces (manure) should be neither too loose nor too hard of unusual color, bloody or peculiar smell

NB: *Different signs from the above mentioned will indicate that the animal is not healthy and should be clinically examined.*

Vaccinations

Vaccination regimes vary from place to place depending on the diseases which are prevalent in particular areas. It is best to consult with the local Livestock office to obtain appropriate information on the needs and availability of vaccines for your particular area.

Table No. 11

The most common diseases for which Immunizations regularly should be done for cattle are the following.

Disease	Class Of Cattle/Age	Frequency
Foot And Mouth Disease	All Cattle	Every 6 months
Hemorrhagic Septicemia	All Cattle	Every 6 months
Black Quarter	All Cattle	Once per year
Anthrax	All Cattle	Once per year
Brucellosis	Calves At 6 Months	Once then at 2 years If there Is an outbreak
Lumpy Skin Disease	All Cattle And Calves	Once per year
Trypanosomiasis	All Cattle	Depending on the area
Contagious Bovine Pleural Pneumonia (ECF)	All Cattle	Once per year
East Coast Fever (ECF)	All Cattle	Once In the cows lifetime
Rift Valley Fever (RVF)	All Cattle	Once per year
	All Cattle	





Table No. 12

WHAT ARE SOME COMMON DISEASES, WITH SYMPTOMS, TREATMENT?

Disease	Symptoms	Prevention	Treatment
Malnutrition	Thin, sickly dull haircoat; little energy; swollen stomach; anaemia; low milk	Balanced Feeding and deworming	Balanced feed; deworming
Liver flukes (*)	Weight loss; low appetite; diarrhea; anaemia	Regular deworming do not drive to river but carry water to cattle	Regular deworming (e.g: LEVAMISOLES, ALBENDAZOLES)
Lung worms (*)	Coughing; no fever; slow growth	Regular deworming	Regular deworming (e.g: LEVAMISOLES, ALBENDAZOLES)
ROUNDWORMS (Large) (*)	Only in calves; slow growth & unhealthy, blocked intestine or scours	Regular deworming	Regular deworming (e.g: LEVAMISOLES, ALBENDAZOLES)
(Small) (*)	Anaemia; diarrhea; poor appetite; swollen stomach	Regular deworming; keep from trampling feed; cleanliness	Regular deworming (e.g: LEVAMISOLES, ALBENDAZOLES)
EAST Coast Fever (E.C.F) (*)	High fever; swollen glands; mucous from mouth constipation	Tick control & vaccination being developed (e.g: ORGANO-PHOSPHORUS COMPUNDS, SYNTHETIC PYRETHROIDS)	Early treatment (e.g CLEXON and TETRACYCLINE)
Heart water (*)	Runs circles & falls down; high fever; off feed	Tick control (e.g: ORGANO-PHOSPHORUS COMPUNDS, SYNTHETIC PYRETHROIDS)	Early treatment (e.g: TETRACYCLINE)
Babesiosis (Red water) (*)	High fever: Bloody urine; off feed	Tick control ((e.g: ORGANO-PHOSPHORUS COMPUNDS, SYNTHETIC PYRETHROIDS)	Early treatment (e.g: BERENIL & TETRACYCLINE)
Anaplasmosis	High fever; off feed	Tick control (e.g: ORGANO-PHOSPHORUS COMPUNDS, SYNTHETIC PYRETHROIDS)	Early treatment (e.g: TETRACYCLINE)
Trypanosomiasis (Trypse) (*)	Wasting away anaemia; frequent fever	3 to 6 month injection with (e.g: SAMORIN) if endemic	Inject with (e.g: BERENIL or NOVIDIUM or others)
Foot & Mouth Diseases (F.M.D) (*)	Mucous from the mouth; wounds on mouth; hooves teats; off feed	Regular vaccination at 6 months intervals	None, treat the wounds & fever, if any w/ antibiotics
Footrot (*)	Sores on fit; lameness with swelling & pus	Avoid possible foot injuries; trim hooves; dry feet, no mud	Clean & trim hooves; treat with (e.g.: PENSTREP)
Heamorrhagic Septicaemia (H.S.) (*)	High fever; difficult breathing; salivating cannot swallow	Regular vaccination at 6 month intervals; isolate from healthy cattle	Treat with (eg.: TETRACYCLINE)
Tuberculosis	Varies; maybe coughing or wasting; diarrhea or abscesses	None, slaughter of infected animal; burial; testing of animals	none



Disease	Symptoms	Prevention	Treatment
Pneumonia	Similar to H.S above	Keep out of wet & cold draughts	Treatment with (e.g.: TETRACYCLINE)
Lumpy Skin Disease (*)	Small bumps or abscesses all over body; high fever off feed	Regular vaccination at 6 month intervals	None, treat wounds and (e.g.: TETRACYCLINE)
Anthrax	High fever; difficult breathing; sudden death & black blood from mouth & anus	Regular vaccination yearly, treat other exposed animals with TETRACYCLINE or PENNICILIN in high doses; DO NOT DO POST-MORTEM BURIAL with care	None unless detected and treated very early
Blackquarter	Lameness; high fever; swollen leg with air pockets under skin; difficult breathing	Regular vaccination yearly; treat other exposed animals with TETRACYCLINE or PENNICILIN in high doses; DO NOT POST-MORTEM BURIAL with care	None unless detected and treated very early
Tetanus (**)	Stiffness in jaw, neck tail and unable to open mouth	Dip navels of new borne calves; good sanitation; BURIAL	Treat with (e.g.: PENNICILIN)
Malignant oedema (*)	Same as blackquarter but swellings are filled with fluid	Regular vaccination yearly, and preventively treat exposed animals as with Blackquarter; BURIAL	Non unless detected and treated very early
Rinderpest (*)	Fever; discharge from mouth & eyes off feed; cough and diarrhea; sores on mouth, nose & tongue	Vaccination at 6 months age & again at maturity	None; no response to treatment
Brucellosis	Abortions at 5-8 months gestation and retained placenta, or no obvious signs	Vaccination at 6 months, and again at maturity Bury dead fetus and slaughter of infected cattle is advisable; pasteurize milk	None; humans can be treated with tetracycline in high doses
Infertility	Silent heats or no signs of heat or frequent heat periods of short duration; repeat breeding	Improved feeding of balanced rations, careful attention to heat detection and the dates/times of heats; early treatment of infections of reproductive tract	To gather with preventive steps, put cow with bull, or manual stimulation of ovaries, or hormone injections; treat infections with antibiotics or antiseptic cleansing
Retained placenta (retained afterbirth)	Afterbirth remains inside the cow; foul smell & wasting shortly after calving	Adequate nutrition; sanitation at time of calving when being helped; let calves suckle until it comes out	Treat with antibiotics (e.g.: SULFA TETRACYCLINE); manual removal of placenta if necessary.
Infection of the uterus	Discharge of pus or other material from vulva; smell from vulva	Use disease-free bulls; sanitation at time of calving if being helped	Uterine irrigation (washing); treat with antibiotics (e.g.: TETRACYCLINE)



Disease	Symptoms	Prevention	Treatment
Infection of the uterus	Discharge of pus or other material from vulva; smell from vulva	Use disease-free bulls; sanitation at time of calving if being helped	Uterine irrigation (washing); treat with antibiotics (e.g.: TETRACYCLINE)
Prolapsed uterus or vulva	After calving cow continues to strain & pushes reproductive organs out also	Calving on level floor; cow to stand up after calving or lying facing down hill; good supervision at time of calving water solution	Immediately getting replaced by washing with cold water and pushing it carefully back inside soak in sugar to reduce swelling if necessary
'milk fever'	(see earlier section in this book on CALVINGS: what do i do if the cow cannot stand?)		
Ketosis	(see earlier section in this book on CALVINGS: what do i do if the cow cannot stand?)		
Obdurate nerve	(see earlier section in this book on CALVINGS: what do i do if the cow cannot stand?)		
Calving paralysis	(see earlier section in this book on CALVINGS: what do i do if the cow cannot stand?)		
General weakness	(see earlier section in this book on CALVINGS: what do i do if the cow cannot stand?)		
Mastitis	Inflamed udder; off-color milk; clots in milk; fever; off feed red/painful under	Clean housing proper milking technique; milk out completely or let calf suckle with antiseptic solution after each milking; good	Clean udder; repeated milking of affected teats every 2-3 hours; wash under with warm then cold water; treat either with intramammary infusion or injection of (e.g.: PENSTREP or TETRACYCLINER)
Calf Scours (*)	Diarrhea with mucous or abnormality; dehydration; often compound with pneumonia	Clean calf housing; clean milk feeding; regular deworming; clean feeds & water; not feed too much milk	Stop feeding milk until it recovers; orally give water * slat/glucose treat with antimicrobials (e.g.: SULFADIMIDINE)
Coccidiosis	Bloody diarrhea	Same as for calf scours above	Same as for calf scours above
Naval ill	Off feed; pain at urination pus and swelling at naval	Dipping naval in iodine at birth observation of naval often	Cleaning with antiseptic removal of maggots; uses ointment (e.g.: SULFA)



Disease	Symptoms	Prevention	Treatment
Wounds	Fresh cuts	Clean wound with disinfectant (e.g: SALVON) or clean, boiled water, shave hair around cut. Decide whether to stitch or tape. if tape, apply antibiotic ointment or powder and then put on bandage it can stay dry. If not, it is best to leave open. Protect from flies by putting repellents (PYGREASE) near to but NOT ON the wound.	
Wounds	Punctures	If the wounds are deep (puncture) treat as above but leave open. Then treat with antibiotic injections (e.g: PENNNICILIN)	
		Use of clean needles for injections; tender, loving handling of cattle remove any dangerous nails, obstacles from the shed vaccinated against lumpy Skin Disease if prevalent in the area; if LSD infects; cattle prevent abscesses by treating with antibiotics, and give good feed & water	Give animal IM antibiotic; do not puncture abscess early until it has become soft & ready; when it is open (ed) clean out pus; any other dead skin or maggots; treat with (eg.: PENNICILIN) keep wound open, to heal from within
Ringworm (*)	Round, dry area on skin; hair loss; grayness	Clean, dry cattle sheds; isolate affected animals	Treat with IODINE or any FUNGICIDE
Pinkeye(*)	Tears; eye in flamed, red	Clean cattle sheds; reduce flies dust; if neglected, it may turn pink or blind	Cleanse eye with saltwater and eye ointment (OPHTHALMIC) antibiotic
Poisonings	If the animal has apparently eaten a poison, and is undergoing pain, with symptoms of not ruminating try to induce diarrhea or vomiting if you suspect it to be nitrite (urea) poisoning (difficult breathing, blood a brown color)	If swallowed, give MAGNESIUM SULFATE with WATER Give intravenous injection of solution of NEW METHYLENE BLUE	
	If you suspect organophosphate poisoning (will show tears, salting, urinating and defecating)	Give ATROPINE SULPHATE injection	
	If you suspect snakebite (swollen would, difficult breathing, shock salivating, sweating)	Give STEROIDS and antibiotics, ant venoms& tourniquet if limbs are bitten to slow venom movement within the body	



Disease	Symptoms	Prevention	Treatment
Allergies	If the allergy has affected the breathing or there is swelling in the throat, try to determine the cause and remove it from the cow	Treat with ANTIHISTIMINESS or STEROIDS	
Bloat	Off feed; rumen swollen hard; no rumination; animal may lie down and swell up; die quickly	Prevent animal from eating too lush feed (fresh legumes can be dangerous); feed dry feed prior to giving fresh feed	Give mineral oils; make it run if it can; puncture rumen with a trocar or knife if necessary
Rumen impaction	Off feed; rumen packed, hard; no rumination; animal in pain; fermented grains	Prevent animal from over-eating dry feeds without water; avoid half lots of water	Force feed with water and magnesium sulfate or oil
Wooden tongue	Cow cannot chew due to swollen tongue; saliva runs non-stop	Hard to prevent; sanitation; treat mouth wounds (?)	Treat with (e.g.: PENSTREP or SODIUM IODIDE)
Shock	Weak pulse; in activity; cold body temperature; vomiting; rapid breathing	Prevent blood loss; keep it warm; keep the animal calm; do not give water until recovered	Open air passageways; give STEROIDS & rehydration by intravenous injection
Johne's Diseases (*)	Smelly diarrhea which does not respond to any treatment; cow wastes away	Isolation of sick cattle; quarantine affected farms and slaughter affected animals	No treatment
Rabies (**)	Wildness, aggression; progressive paralysis; death	Control of rabies carriers; slaughter; vaccination if there is an outbreak	No treatment

(*) - Infectious diseases which can readily pass from cow, and require care to prevent through the herd or to neighbors' cattle; includes those passed by internal or external parasite and infections which can be passed by contaminated environment or dirty needles.

(**) - Infectious diseases which are dangerous also to man, and require extreme care to prevent passing to humans

NOTES: The treatments recommended are only given as example, and for many diseases, there are many medicines which are effective. the author thinks it is beyond the scope of this manual to train on the forms and uses of all the common medicines for cattle, but that it would be helpful to farmers to know an example of a medicine (at least the generic, not brand, name in order to aid them to seek help or treat their own cattle in the event it becomes necessary. no intention slighting of certain drugs or companies has been intended. farmers are encouraged to continue to utilize qualified veterinary care when available

TOPIC NO 11: FARM RECORDS

Introduction

Record keeping is the often neglected task of the busy farmer who may often fail to recognize the actual profit -loss situation without an outside help.

Record keeping should become a natural thing for a successful farmer who wants to know exactly the profitability of each enterprise and each animal, the pedigree information which warrants a higher price for certain offsprings, actions to be taken in a timely way with regard to cattle breeding, calving and disease immunization.

- Records of dates of calvings pedigree which proves the value of salable offspring's.
- Records of milk yields lactation lengths.
- Records of farm income and expenditure.
- Visitors' records
- Records of advice given by extensionists/Veterinarians who visit
- Records of dates of deworming, vaccination, immunizations and treatments against disease
- Records of dates of heat periods, breeding, pregnancy checks and bulls used.





Cow Identification

Cow Name:	Cow Name:
Number:	Number:
Breed:	Breed:
Birth Date:	Birth Date:
Date Animal Received:../.../...	Date Animal Received:../.../...
Source:.....	Source:.....

Date	Illness/Event	Outcome

Breeding / Reproductive Information

Lactation No. :.....				
Date Last Calving:.....				
Dates on Heats				
Service Dates				
Bull/A.I				
Bread and Owner				
preg check: Date & Result				
Date to Dry				
Date to Calve				

Vaccination record form

VACINATIONS - (when done/Due)

	T R Y P S	B Q / A N T H R A X	F M D	C B P P	R I N D E R P E S T	B R U C E L L O S I S	L S D
DATE VAC'D							
DATE DUE							
DATE VAC'D							
DATE DUE							
DATE VAC'D							
DATE DUE							
DATE VAC'D							
DATE DUE							
DATE VAC'D							
DATE DUE							

(ID)				Birth Date	weaning 12 Months Date	Wt	Date	Wt	Remarks
Number	Name	Sex	ID	Weight	Date	Wt	Date	Wt	



TOPIC NO 12: ENTREPRENEURSHIP

Introduction

Entrepreneurship is an integral part of the economic growth and development of any country. Entrepreneurs' involvement entails establishing and boldly managing commercial activities aiming at making profit.

Entrepreneurship also includes identifying opportunities, market search and investment planning.

What is entrepreneurship?

Entrepreneurship is the process of starting a business or an organization. The entrepreneur develops a business plan, acquires the human and other required resources, and is fully responsible for its success or failure.

Table 13: Traits of a successful entrepreneur

Focused and motivated to achieve his objective	<ul style="list-style-type: none"> • Ability to make decisions • Highly disciplined • Can rise against before him challenges • Never despairs
Uses effectively emerged before him opportunities	<ul style="list-style-type: none"> • Knows well the needs of his/her customers • Abides by the most current tide of the market • Does not do things in a rush • Strives to do something special/unique.
Tenacity	<ul style="list-style-type: none"> • Ability to live with uncertainty and push through a crucible of obstacles for years on end. • When failure happens, he/she starts all over it again
Passion for success	<ul style="list-style-type: none"> • Has an intrinsic drive that provides internal reward that can sustain the company. • Knows his/her shortcomings • He sees the ability to control fear as the most important trait of all • Sets achievable objectives
Creative and self-reliant	<ul style="list-style-type: none"> • Innovative when solving before him challenges • Ability to overcome fear to fail • Ability to adopt new innovations
Sets short and long term objectives	<ul style="list-style-type: none"> • Plans for his /her activities • Plans for the future



Principles of entrepreneurship

- An entrepreneur checks for facts and learns as much as possible about business issues.
- Learns the stability and sustainability of his/her business.
- Identifies weak areas and takes action for strengthening them.
- Understands customer requirements and makes efforts to avail the in demand products.
- Knows his/her financial situation and how to keep accurate financial statements and records

Type of business ownership

Entrepreneurship has the following types of ownership:

1. Single ownership

- Business owned and operated by one person whereby the property is wholly owned by one person.

2. Ordinary Partnership

- The system that allows business to be owned by at least two people (2) or more.
- Partners collaborate in gain accrued and loss encountered, but resolve issues abiding by the written agreement. Merchants who are in partnership have a legal right to protect one another. Payment for rent for those ventures is paid from shares which includes a tax benefit but no joint ventures.

A general partnership exists when partners divide responsibility for management and liability as well as the shares of profit or loss according to their internal agreement

- ### 3. A co-operative business is that which is owned and run by the members - the people who benefit from the co-operative's services. Co-operatives are a flexible business model. They can be set up in different ways, using different legal structures, depending on what works for the members

Business idea

For a business idea

Before a person starts a business, usually begins to get an idea of what should I do? These ideas are the two main steps:

The first step

Various thoughts flood his head with an example: I do not know how to set up shop, I do not know how to sell the meat, I do not know how to clean.

An idea of this kind is called a crude idea as it is not filtered. Despite this, these idea is pending preliminary investigation to see if they are feasible. If you start a business at this stage, the possibility of collapse is high.

The next step

A crude idea is evaluated, to see if it can be enforceable. If it turns out to be a perfect one, then the business idea is called appropriate. Despite this, business success depends on the ability of the executor or seeker.



Designing a business idea is essential to an entrepreneur because of the following:

- It is the first step before starting any business.
- It is important to make the business successful.
- Often customers prefer a change of new things to existing ones.
- To match the changes in technology.
- Identifies potential risks likely to face your business.
- It is essential to the success of your business.
- In order to access business opportunities when they appear.

How to establish a business idea

Business establishing ideas are a function of the following factors:

- Experience of the family in question has in doing business.
- Inspiration gained following a visit to trade fairs at district, regional, and even international levels.
- Study visits to other parts of the country outside your own environment to see what others are doing.
- Watching business advertisements on TVs and reading newspapers on the same.
- Joining entrepreneurship groups, communities and even various business clubs.
- Calamities such as floods or other natural disasters.
- Breaking the income poverty loop can be a catalyst for one to start a business enterprise.

Implementation of the business idea

For the business idea to be transformed into business the following has to be done:

1. Order of business idea,

- Type / state of business of your thought
- Who will hold the business - family, partnership, group, etc.
- The type of license required - grocery, alcoholic beverages, restaurant, shop etc.

2. Identify the market for consideration the following factors

- Type of product / service which the business intends to offer to customers?
- Approaches and methods to be used in order to be different from your competitors to attract business customers.
- The best way for distribution and marketing of goods/services.
- The best location and affordable in terms of running costs for your business.
- How to advertise your business.

3. Consider how to organize and run your business

- You will need to identify the suppliers of the goods needed to run your business.
- Do the business premise need a facelift maintenance.
- Where to find raw materials
- How to choose and how to motivate employees of your business.
- Consider how to organize production and marketing of your product.

4. Financial Analysis

- Analyze the cost of production.
- Plan commodity/services prices.



- Estimate profit gains and losses.
- Estimate the cost of investment and working capital.

5. Plans

- Make plans and steps to set the business into motion.
- Align and plan how to appropriately invest funds at hand.
- Plan measures to implement the business idea.
- Identify different ways of earning money through investments.

How to come up with a good business idea

A good idea enables an entrepreneurial merchant to succeed. Therefore, it is good to know how to measure success. Business success is measured by using the following criteria:

- Profit gained
- How smooth is the running of the business.
- The idea should envisage expansion and growth strategies of the business.
- Business should meet the satisfaction of the clients.

Problems affecting business ideas

1. Not believing in the viability of the business idea which is caused by:

- Not having faith in the idea.
- Bureaucracy there in for obtaining a business license.
- Lack of management and leadership knowledge and skills.
- Lack of technical / professional knowledge.

2. Problems associated with markets resulting into small volumes of sales. This can be caused by:

- Very few customers coming for your goods/services
- A large number of competitors
- Effectiveness of potential competitors.
- The price of the product / services delivered. Is it too expensive?
- Inferior quality of the products sold.
- Lack of a clear business direction
- Poor or no business advertisements.

3. Problems associated with leadership

- Lack of staff with business skills.
- High prices of raw materials.
- Failure to produce quality products.
- Poor management of funds, raw materials and other supplies.

4. Lack of financial management skills

- Many debtors.
- Many creditors (payable immediately)
- Weak capital base.
- Poor or no bookkeeping at all.



5. Lack of planning

- Lack long-term plans.
- No new investments.
- Ignorance in planning and designing of new business products.

How to Establish a Business

Business analysis and its importance

For a successful business enterprise it is important that a thorough business analysis is made by an entrepreneur. A thorough analysis will give a picture on what to produce, what goods are fast moving, and which ones are profit making. A Business analysis also enables an entrepreneur to know the volume of capital investment needed to start a business and the internal rate of return on investment.

Business Analysis preparation

In order to prepare a business analysis one should focus on the following key areas:

- Personal information of the entrepreneur.
- Type of business to be conducted (service or product)
- Place or area from where the enterprise is intended to operate
- Targeted market
- Get the information of competitors.
- Business analysis should put in place strategies for a successful business.
- Capital investment volume required.
- The source of capital to run a business – Bank loan? Personal savings? partnerships?, etc.

Elements of business analysis

- Explain the type of business you intend to do
- What is the targeted market (customers category?)
- Do you have any strategy of getting hold of these clients?
- How will this strategy be executed?
- How will money be spent to meet business needs?

Advantages of business analysis

Business analysis will help attain the following:

- Find out if your product or service will be purchased.
- Helps knowing your competitors in the business. How are they doing their businesses?
- Helps to establish the price of your business goods based on the costs involved in acquiring them.
- Helps to project whether the business is making profit or loss.
- Simplifies business implementation.
- Banks see the importance of lending.
- A good business analysis gives you a vision of the direction.



Business information sources

1. Customers

These can provide information on products and services that they would like to acquire from you. Ask customers what they need and also to get their ideas on the strengths and weaknesses they see in your business.

2. Distributors

These also are the most important people in giving account on how you may be prospering in your business and can offer suggestions for improvement.

3. Competitors

Competitors dealing with the same products and services can have common challenges. These can be shared among themselves.

4. Experts

Their work requires them to give business information without asking for payment. eg Banks, Business Advisors, Accountants, Cooperative Officer, Chief Taxation, Land Officer, etc. However such documents as business licenses and bank fees have to be paid for.,

Markets

Background

Markets for livestock and agricultural products in particular, milk and dairy products, vegetables and fruits may change from time to time due to the fact these products are perishable. They need appropriate storage facilities. Their prices will be influenced by the market forces of demand and supply.

Market analysis

Market is a business philosophy that says, any business should concentrate on meeting customers 'needs and wishes. An entrepreneur has to give what the customers need on time at the right price and at the right place

Some businesses are market oriented while some are production oriented. Those which are market oriented depend on what can be sold while the ones that are production oriented rely on what is generated.

It is obvious that the businesses that focus on customer requirements have the potential to grow and can attain considerable success.

Market analysis preparation

- Estimate the size of your market
- Volumes of prospective customers with potentiality to expand and grow
- Set clear objectives of the analysis strategy.
- Identify the type of product (model, type, quality) that you intend to take to the market.
- Set clearly the selling price of your products.
- Show how the products will reach your customers.
- Show how you will be getting feedback from customers.



Market monopoly strategies

1. Discover what customers want

- Effectiveness
- Set affordable and reasonable prices
- Accessibility to your business place
- Security of your business place
- Quality of products / services rendered

2. Know when do your customers buy?

- Morning, afternoon or evening
- At the beginning or end of the week
- At the beginning or end of the year

3. Know the type of buyers your customers are?

- How are the volumes of purchase fluctuate according to seasons of the year.
- Are they borrowing type or pay cash upon receiving goods customers?

4. Sales volume per month?

- Do you have competitors
- Do they affect your business?
- Do their prices give you an edge for the market?

5. How do set your prices?

- Do you align them with government set prices?
- Do you align them with those of your competitors??
- Do you set prices on your own?
- Should a need arise will you be able to reduce the prices of your commodities?

6. Understanding your market

- When you enter into a business, it is advisable to assess the situation of the market forces. This will help you know if there is a demand of the products or services you intend to offer.

7. Who are your current customers?

What kind of customers do you have at your disposal? For example, their age, income and education, likes and needs.

- Where do they live, and what do they prefer to buy?

8. Distribution of products / services to your customers

The following elements will help provide the right decision from the realities of your circumstances and financial capacity:

- Will you be delivering goods to your customers' homes?
- Will you use vendors?
- Will customers come to your business place?



Investment Planning

Financial planning and investment in business

Financial planning is important in any business planning. To have a good financial plan you need to answer the following questions:

1. How much capital do you need to invest into the business.
Answer
2. How much capital do you have personally to invest into the business?
Answer
3. What do you expect to buy for investing into this business?
Answer
4. What costs are needed to be incurred to cater for investment preparations?
Answer
5. What and how much do you set aside for emergency expenses?
Answer

Total cost for the components 3+ 4+ 5 = S.

The difference between the figure shown in the answer to question 2 and the figure represented by S will give you the amount of funds needed to start a business enterprise.

Where will the additional funds be gotten from?

Is this your financial plans are considered to use the help of an expert on financial matters?

To assist you in putting effective financial planning considers the following factors:

- Remember to regularly increase the cost of emergency matters.
- Envision to have as much huge investment capital as possible.
- Keep estimates of the things that will add up to your capital.

A. Needs for a long term capital

Activities	Value (Tsh)
Rent, cost of registration	
Cost of new buildings / renovations	
Laboratory Equipment / garage	
Processing machines	
Other equipment	
The initial cost of starting a business	
Cost of advertising	
Payment in advance - rent	
Sub-total	



B. Needs for a short term capital

Activities	Value (Tsh)
Monthly bills (electricity, water, telephones, transport, etc.)	
Frequent purchases	
Cost of business	
Operating expenses	
Sub-total	
Total capital required A + B	

Financial planning

Financial planning gives you an understanding of the amount of money needed to start and run your business. Planning allows you to know from where money for investment will be accrued.

There are many financial institutions in the country and abroad from where funds to start a business can be accessed. Do not be afraid to borrow so long as you are sure that you can pay these loans without delay.

Domestic financial instruments

Value	Value (Tsh)
Private capital	
Cash	
Capital assets (land, buildings etc.)	
Contributions of members	
Construction capital	
Sub-total	

External financial instruments

Activities	Value (Tsh)
Long-term loans	
Bank loans	
Credit insurance	
Loans from relatives	
Loans from non-governmental organizations	
Short-term loans	
Transfer of bank credit	
Sub-total	



Plans for profiting

Sole proprietorship businesses are meant on the fore to foster the economic development of the proprietor himself. The goal of every proprietor should be to source out the means of a sustainable livelihood from the business at the same time allowing the business to grow in volume.

An example of a Six month business sales forecast.

Month	January	February	March	April	May	June	Total
Expected sales							
The price of each							
The aim of the sale							

Sales forecast

When forecasting for the volume of sales, two things should be considered:

- Merchandise volume
- The prices at which the merchandise will be sold.

Things to consider when setting prices of goods

- Costs involved in sourcing of and transporting the merchandise to your business point
- Prices set by your competitors
- The purchasing power of your competitors.

Profit estimation

Activities	Value (Tsh)
Sales value	
Total sales	A

Business operating costs

Cost of materials	
Labor costs, electricity, water etc.	
Cost of purchasing and supply	
Administration costs	
Salaries	
Other donations	
Sub-Total	B



Costs of business workplace

Activities	Value (Tsh)
Rent	
Water	
Electricity	
Maintenance	
Su-Total	C

Costs of business workplace

Activities	Value (Tsh)
Road License	
Insurance	
Service and maintenance	
Operation costs	
Revenue and tax	
Sub-Total	D

Costs of business workplace

Activities	Value (Tsh)
Loans interest	
Bank charges	
Tax	
Sub-Total	E
Grand Total: B + C + D + E = F	
Business profit	

Costs of business workplace

Business profit = A - F	
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