

Animal Production

Level – III

Based on March 2022, Version-4 Occupational Standard



Module Title: Carrying out Camel production

LG Code: AGR APN3 M04 LO (1-5) LG (13-17)

TTLM Code: AGR APN3 TTLM 0523v1

May, 2023

Adama, Ethiopia

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Introduction to the module

This module outcome deals the process of developing Production plans for camel. It requires the ability to determine Feasibility of camel enterprise, identify and define determinants of camel profitability, establish camel production targets, Prepare production plan, and review production plans to Determine input and service requirements. Developing Production plans for camel requires knowledge of camel Husbandry, production and management practices, financial analysis techniques, sustainable land use principles and practices applicable in the region, environmental controls and codes of practice applicable to the enterprise, and whole farm planning processes. According to FAO statistics there are about 19 million camels in the world, of which 15 million are found in Africa and 4 million in Asia.

Of this estimated world population, 17 million are believed to be one-humped dromedary camels (*Camelus dromedarius*) and 2 millions two-humped (*Camelus bactrianus*). Approximately 11 million dromedaries, representing two thirds of the world's camel population, are in the arid areas of Africa, particularly in North East Africa, i.e. Somalia, Sudan, Ethiopia and Kenya. Objective and subjective criteria may include size, age, breed, teeth for age and deformity, general appearance and condition, colors, temperament, disease susceptibility, percentage deformity, sex growth rate, body weight, breeding history, growth rate, milk production and milk quality.

The unit requires the application of skills and knowledge to carry out identifying sexual maturity, selecting appropriate breeding season, mating plans, use selected sires and dams, and monitor camel condition and assist in mating. It also requires the ability to monitor mating and take remedial action where needed, record data, and monitor and report on the effectiveness of the mating program and also cover take care of pregnant camel and assist parturition.

LG#13	LO#1. Develop production plan for camel
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Instruction Sheet

This learning module is developed to provide you the necessary information regarding the following content coverage and topics –

- developing production plan for camel
- Selection of camel for milk production
- Identifying Camel reproduction requirement
- Undertaking camel raising work
- Handling and cleaning material and equipment

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- develop production plan for camel
- Select camel for milk production
- Identify Camel reproduction requirement
- Undertake camel raising work
- Handle and clean material and equipment

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test

Information Sheet# 1

1.1 selecting camel types

Taxonomy of camel

- ⇒ Kingdom - animalia
- ⇒ Sub kingdom - metazoa
- ⇒ Phylum - chordata
- ⇒ Sub phylum - vertebrate
- ⇒ Class - mammalia
- ⇒ Order - artiodactyla
- ⇒ Sub order - thylopoda
- ⇒ Family - camelidae

Genus camelus

lama

- ⇒ Species c. dromedarius (dromedary) L.glam
- c. bacterianus L.pacos
- L. guanicoe
- L. vicugna

- Camel belong to the old world /true camels
- Lama belong to the new world camels
- Camelus dromedarius (the dromedary or arabian or one humped) the desert camel
- Camelus bacterianus/the bacterian camel
- Dromedary believed to be involved from bacterian camel
- Camelus dromedary is more common
- C. dromedary is the most valuable animal in harsh & different environment

Bacterian camels on the other hand have similar functions in cold deserts of Asia, Russia and China

1.1.1. The old world camels /true camels

They belong to the genus camelus which consists again two species under it

- a. Camelus dromedarius (the dromedary/Arabian camel/one humped camel/the desert camel)
- b. Camelus bacterianus(the bacterian camel)

The name dromedary camel was derived from the greek word “dromedos” meaning running where as the world bacterian camel was derived from the name of the place ‘Bacterian found in Afghanistan. Some authorities list these two types as separate species although the principal difference lies in the development of hump. A vestigial hump is known to occur in the dromedary although outward physical evidence is not obvious. The two types inter breed and have been deliberately interbred in some countries where the dromedaries are usually the preferred dam. Hybrid is single humped and exhibit marked hetrosis.

The dromedary camel is believed to be evolved from bacterian camel. The justification for this belief is

1. The species have embryological similarity, i.e. both dromedary and bacterian camel have two humps during embryological development
2. Unlike other species these two species of camels can hybridize giving fertile cross breed animal. The cross breeds possess on hump and are larger than either of the parents

Characteristics of the two types of camel

	Dromedary	Bacterian
Habitat	– hot arid & Semi-arid Africa & Arabian	- cold desert of Asia
Population	– numerous	- few
Morphology	- single hump	- double hump
Size	- large	- smaller
Coat	- woolly but shorter coat cover	- woolly but thick
Voice	- grunt/loud	- shrew
Other phenotypic	- broad fat, long eyelashes	
Characteristics	-trap door nostrils, & extremely thick lips, - Long legs -Carries its head high - This helps for adoption in hot climate	- short legs - carries head low

1.1.2. The new world camels

They belong to the family camiliadae and the genus Lama which has again 4 species under it.

1. Lama Glama(the llama)
2. Lama pacos (the alpaca)
3. Lama guanicoe (the guanaco)
4. Lama vicugna (the vicugna)

Types and breeds of dromedary camel

- Different classifications of camel
- Classification of camel based their natural breeding areas (habitats):
- Based on this classification, camels are divided in to:
 - Hill (mountain) camel
 - Plain camel or low land camel

- Hill camels are small, compact, short and muscular animals which are fit for work as baggagers.
- Plain camel on the other hand, is large and long animals



Figure 1.1. Bactrian camel



Figure 1.2. Dromedary camel

Dromedaries can also be classified based on morphology in to three groups.

1. Brachymorphic dromedary: They are large and heavy animal used for laggages. Example, Egyptian Caravan camels.
2. Mesomorphic dromedary: They are medium in size and also used for laggages. Example, Libyan camel
3. Dolichomorphe dromedary: This is common among Saharan people and used for riding.

Classification based on people (tribes) who bred them

- Example, Esamadobe and Isa ad camels of Esama tribes of Somalia.

Classification based on coat colour

- Examples are Grain camel and Cajeh camel in Ethiopia. Grain camels have brownish yellow colour while Cajeh camels have red color.

Classification of Ethiopian Camels

- Ethiopian camels are kept primarily for the purpose of milk and meat production.

- They are also sometimes used for pack animals for nomads. Generally Ethiopian camels are classified mainly based on coat color and locality.

Classification based on coat color:-

Based on this camel are classified in to:

1. Grain camel: grain camel have towny colour i.e. brownish yellow colour.
 - These camels are found in red sea coast which are inhabited by tribes called Habab, Adshekh, Ad Temeryam, Ad Moalim and Ad Soara and used for baggages (pack animals).
2. Cajeh camel: Cajeh means red in Tigreigna language so that have reddish colour. They are raised by Beniamer tribe of Eritrea. These camels are use for baggages.

Classification based on locality:

Based on locality camels in Ethiopia are classified in to:

1. Danakil camels which are found in desert of Danakil in Afar.

- They are owned by Afar people and used for milk and occasionally used for Pack animals.

2. Ogaden camels: As the name indicates these camels are located around Ogaden Region and used for milk production and for transport purposes.

3. Borana camels.

- They are also located around Boran areas and used for milk production and transport.
- Other camel types of mixed breeding especially Arab blood are found in small number in the country. Generally, the camels in Ethiopia are found in peripheral (low lands) part of Ethiopia.

1.2. Determining camel production system

Livestock production systems in Ethiopia can be broadly classified into two

A. The traditional production systems (pastoral nomadic, pastoral transhumant, agro-pastoral and smallholder mixed crop-livestock) and

B. The modern production systems (ranching, intensive/semi-intensive peri-urban/urban, feedlot and commercial production).

Camels are predominantly kept in the pastoral and agro-pastoral production systems. Only few male camels are to be found in the mixed crop-livestock system. Pastoralists keep indigenous breeds/types and obtain more than 50% of household income from livestock and livestock products. The system is much simpler than the mixed crop-livestock systems of the highlands. There are few inputs other than labour. Herd and flock composition is regulated to some extent (only few breeding males are maintained). Grazing management and herd movement are determined by the seasonal patterns of rainfall and availability of water.

There is little to no interaction with crop agriculture, and although a range of livestock species is managed to reduce risk, one or two species dominate. For example, camels and goats are the main species in Afar and Somali, while in Borana zone, cattle are still the main species. Production is mainly for subsistence, but surplus animals are sold. Generally, camel populations have been increasing in the pastoral areas during the past 20years

1.3. Camel production factors & objectives

Consider the resources available for developing the camel farm, and design a management system that makes the most efficient use of them. The resources may include

- **Land** - the number of camels to be held in the farms is affected by the amount of land available for fodder production, etc.
- **Climate**- Rainfall, temperature, and humidity may affect the housing design, health condition
- Camels- availability of foundation stock
- **Finance**- funds available for farm development and recurrent costs, timing of finance
- **Infrastructure**- roads, electricity, communication
- **Market Access point**- feed supplement, drugs, equipments, forage seeds, fertilizers, irrigation equipments, building materials, fencing

- **Personnel- camel management** skills and experience of available staff, skills and availability of veterinary personnel,
- **Infrastructures-** Buildings (housing, Hay barn, Stores, Isolation pens, postmortem/slaughter room)
- **Equipments-** feed troughs, water containers, weighing scale.

1.3.1. The Ideal Camel Environment

It is useful to draw on this information to reconstruct an ideal Camel environment. Low rainfall and humidity are preferred as they discourage bacteria and insects and so help to minimize disease. High temperature, wind speed, solar radiation and evapo-transpiration are also preferred as they encourage the key food plants adapted to these arid conditions. Saline or well-drained sandy soils are preferred, and the former for the saline water on these soils and for halophytic plants, the later for the browse plants which grow there. Camels do not like poorly drained easily waterlogged black cotton soils, which become stick in the rains.

1.3.2. Production objectives

Camels are very valuable animals because:

- They can withstand excessive heat load from the environment, shortage and salinity of drinking water and feed.
 - They compete less with crop and livestock production and urbanization since it can feed in areas (marginal lands) that would otherwise be unused. Even when other livestock are presented, the camel does not compete with them due to its different niche, rather it improves the range condition for other grazing animals by Minimizing bush encroachment.
 - The camel utilizes arid and semiarid environment in friendly manner with the ecosystem/Harmonized form
- Its spongy nature of the feet-pad does not cause soil so damage (damage to the vegetation)
 - It takes only few bites- from a plant and moving to another which simulates pruning, and facilitates vegetative growth

- Its ability to stay without drinking water for longer periods enables to graze range land uniformly and minimizes local over grazing
 - The camel is able to lactate throughout the year and provide large volume of milk with high nutritional and keeping quality.
 - They also an important source of power for ploughing, transportation, and riding purposes.
 - Camels consolidate the social organization as they serve in bride price, payment for blood compensation, gift for relatives.
 - Social and cultural use - Camels play an important role in the society, culture and religion of camel keeping communities. A man without camels is like a cripple.
 - Use for tourism and mobile services.
 - Use of camels for food and transport- Camels produce milk, meat, hides, and bones, which are used by camel keepers' families for their own needs but are also now being more and more sold in the market.

They play role in religious and cultural ceremonies and serve as source of prestige.

1.4. Identifying resource requirements

Handling equipment

Camel Control, Hobbles and Ropes:

Now you decided it would be fun to take your camel on a camping trip. Resource required is

- Production facilities
- Infrastructure,
- management labor resources, and
- Capital requirements.

Identifying materials, tools and equipment

- **Draught equipments:** are materials required for ploughing such as saddle, rope (i.e. Site hobble, sisal, plastic or leather ropes are required).
- **Saddle:** - Pack and ridding saddles are required.
- **Weighting scale:**-For measurement of weight of camel, feed and quantity of milk
- **Milk collection pails and store cans:**-these are used for collecting the milk after milking and also used to store and transport the milk.
- **Identification materials:**-for identification purposes of camels Ear tags, branding iron, tattoo pliers or other identification materials are used.
- **Restraining materials:** - for castrating, treating and other handling purposes, we need to have restraining rope (i.e. . Halters and Calf muzzle rope).
- **Thermometer:** - To check the temperature of the camel by inserting it into the anus for a minute.
- **Veterinary equipments:**-like Syringes (5 to 20ml cap.) for vaccination, injection of chemicals
- **Mineral boxes:**-for placement of minerals lick such as salt inside it.
- **Open castration equipments:** - Useful for the removal of testicles (male sex glands in which sperms are produced) of a male animal.

1.5. Identifying production risks and strategies

Risk management is the identification, assessment, and prioritization of risks, whether positive or negative. Followed by coordinated and economical application of resources to minimize, monitor, and control the probability and/or impact of unfortunate events or to maximize the realization of opportunities. Risks can come from uncertainty in machine operating , financial markets, project failures (at any phase in design, development, production,) legal liabilities,

credit risk, accidents, natural causes and disasters as well as deliberate attack from an adversary, Several risk management standards have been developed including the Project Management Institute, the National Institute of Standards and Technology. Methods, definitions and goals vary widely according to whether the risk management method is in the context of project management, security, engineering, industrial processes, financial portfolios, actuarial assessments.

1.6. Determining feed requirements

Camels are like goats and can browse, eating bushes and the branches of trees. Like cattle and sheep they also graze on grass. The camel browses or grazes for 8 hours each day and will take another 6 to 8 hours to chew the cud. They can be fed like cattle and will eat straw, hay, silage, grains and cakes.

- Age and stage of production
- Birth to a week-colostrum's-adlibitum daily
- 1 week to 3 week-whole milk or replacer-one quarter daily.
- 3 weeks to 9 or 18 months-whole milk and leaves-less than 500cc daily.
- Dry pregnant-free grazing
- Milking camel-free grazing and supplementary feed in:
 - ✓ Sex
 - ✓ Category
 - ✓ Grazing poor- supplementary millet: 8.9 kg straw,
 - ✓ Grazing none- 13.3 kg of straw
- Trotting camel:
 - ✓ Grazing good- 4.5 kg watering a day and salt
- Walking camel:
 - ✓ Grazing good- no grain but some salt
- Trekking camel:
 - ✓ Grazing variable- 2.27-4.5 kg grain per day and salt
- Riding camel:
 - ✓ Grazing is available, 2.27 kg grain per day
- At rest:
 - Grazing is available, 3.6 kg grain per day

1.6.1. Feeding behavior and feed preference of camel

All livestock species (free ranging animals) ingest higher numbers of forage species during the growing season than during dry season. Goats (20 and over 25 forage species in growing and dry season respectively) followed by camels (18 and 22 forage species respectively) accept the highest number of forage species resulting in a more even utilization of available vegetation. Camels in contrast to cattle spend less than 5% of their feeding time near ground level and about 70% at heights of over 1.0m above ground. The preference of the camel for higher vegetation strata, gives the camel the advantage of continuous access to high quality plant material since all plants reaching this height are shrubs, bushes and trees, which are deep rooted, often tapping into the groundwater and remaining green long into the dry season or throughout the year. When the herblayer is dry and highly lignified. Plant species reaching the higher strata of the vegetation as a rule belong to the dicotyledon group. Since over 90% of their intake comes from dicotyledon plants, they can be referred to as browsers. The one-humped camel when given the opportunity, selects a diet, which is higher in quality than the average of what is available, making the camel a ‘concentrate selector’. When allowed free choice, its preferred diet comprises mainly browse. A diet on browse consists on average of about 35% of leaves of leguminous and other trees and 65% of seeds, pods, flowers and twigs. Its ability to select high quality feed is helped by the long neck and legs and grasping upper lip and mobile tongue.

Camel in this respect is rather like the giraffe. Camels will not only eat tree fodder but also graze grasses if no or little other choice is available. In parts of Pakistan, India, in eastern Ethiopia, western Somalia, parts of Mauritania and in southern Arabian Peninsula, they are also grazers. In addition, the camels maintained by farmers in irrigated areas in Pakistan where crop agriculture is predominant, willingly eat green and dried guar and gram bhoosa. Browsing is, however, of considerable advantage to the camel itself in reducing competition for feed resources with other species. The browsing habit is also advantageous for the camel owners in allowing them to keep a greater total biomass (more numbers) of domestic herbivores on a unit area, without contributing to increased environmental degradation and at the same time adding to the sustainability of the system. When given a free choice, the feed preferences of the camel and its

ability to select the most nutritious and digestible parts of plants ensure that it has a good quality diet that is high in protein throughout the year. It is able to maintain on a diet with a minimum crude protein content of 14% in the dry season.

1.6.2. Feed resources:

Most camels are raised in arid areas with little and unreliable rain fall. Forage growth is usually very sparse in such areas where large grazing areas are needed per animal to satisfy the nutrient requirement. Camel therefore, possesses remarkable ability to exploit the scanty feed and water supplies found in natural habitat in the arid and semi-arid areas where this is not suitable for most other animals. Camel could consume hard thorny plants like acacia and are capable of ingesting thorns up to 1cm long. In some desert areas, camels live entirely on browsing on low bush plants such as camel thorn and salt warts .Studies had identified that some 200 different types of plants were consumed by the camel, although no more than 15-20 could be found on any grazing pasture. This indicate camel consume wide variety of plants. The availability of this natural vegetation varies in d/t season.

Feed supplementation to camel

Camels are able to derive enough nutrition by grazing and browsing, and need supplementation when

- they perform heavy tasks
- when forage is not available or is inadequate
- when animal is sick and emaciated
- when they produce large quantities of milk
- for better reproductive performances
- The average daily feed intake of camel on dry matter = 2.5% of body weight

Dosage and Administration:

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Pregnant & lactating females: 50g/day Young camels less than 300kgs: 50g/day

Note: Avoid mixing supplement into feed containing iron supplements as the iron may reduce the potency and bioavailability of the Vitamin E.

Example. If a camel weighing 400Kg then the daily DM intake = $2.5/100 \times 400\text{Kg} = 10\text{Kg}$. A daily ration of 142 gram may be considered the minimum quantity of salt required for camel

Identifying the status of camel condition

- Body condition score 1. Was the most weak and emaciated animal.
- Body condition score 2. Weak animal
- Body condition score 3. Fair animal
- Body condition score 4. Good animal
- Body condition score 5. Excellent animal

1.7. Determining feeding strategies

Feeding strategies include

- **Browsing** : a type of herbivores in which a herbivore feeds on leaves, soft shoots, fruits of high growing, generally woody plant such as shrubs
- **Grazer**: slowly work over a surface (such as rock, sediment, plant, shell) and continually gather and ingest food as they go. Grazers are usually herbivores.
- **Providing supplementary feed** (crop residue, concentrate, and others

Good nutrition is essential for the camel to grow well, to reproduce and to produce milk, because it affects health, fertility, growth, birth weight of the calf and milk yield. As with humans, good nutrition means the camel must get enough protein, energy, roughage, vitamins, minerals and water. Foraging camels spread over a large area, thus putting less pressure on the vegetation in any one area. This feeding behavior also makes camel herding more challenging.

Camels are browsers. Their long legs and neck allow them to browse up to 3 metres above the ground, so they can eat foliage that other livestock cannot reach. Because of the kind of forage

they prefer and the fact that they feed at higher levels, camels rarely come into direct competition for grazing with other animals like cattle and sheep. This means that keeping a combination of different livestock species allows the fullest use of the available pasture land Suitable camel feeds given the opportunity; camels prefer to feed on shrubs and trees. However, in their absence, they can live comfortably on herbs and annual grasses. Camels are highly selective feeders and require 8-10 hours of grazing daily to be satisfied. This depends on breed, body size and seasonal feed availability. During drought, camels require a daily grazing time of up to 12 hours. Under normal rangeland conditions, camels select a diverse high-quality diet that provides all the nutrients required by the body.

Camels are also able to survive on low quality fibrous roughage. They adapt well to different diets and dietary conditions. During the dry season, when other forage is scarce, camels can browse on the green tips of trees (for example acacia) that are out of reach for other livestock, or feed on Euphorbia, which is toxic for other livestock species, so they are better able to survive droughts. However, there are some plants that are poisonous to camels – for example, the Capparis tomentosa – so areas where such plants are concentrated should be avoided Ingestion of toxicplants is often linked to periods of extreme feed scarcity and/or to animals being introduced into a completely new area.

I. Mineral requirement

Camels like salt and prefer grazing and browsing on salty plants (i.e Indigofera spinosa). They need much more salt than other livestock species. Pastoralists, knowing that camels need extra salt, try to take their camels to naturally occurring salt sources (saltlicks, salty springs).A camel's salt needs under normal dry land conditions range between 30 and 60 grammes a day. A camel working hard in the hot season may need as much as 140 grammes of salt daily. It is good to provide salt to camels daily in the boma/barn.

Still, research shows that camels suffer deficiencies of certain minerals that are either not found in natural sources, or are not present in sufficient quantities. This means camels need properly formulated and balanced minerals for good all-round nutrition. One option is to buy industrial

chemicals that supply key deficient elements and mix them with natural saltlicks or other low quality livestock salts sold in the market.

II. Supplementary feeding of camels

Under normal circumstances, camels can get enough good quality nourishment from natural vegetation. However, during periods of scarcity, supplementary feeding is good for them, especially for pregnant and lactating camels and their calves. Because of this, it is a good idea to harvest and store feed material like acacia pods, especially for settled households.

The nutritional quality of natural vegetation is highest when it is beginning to dry up, so this would be a good harvesting time. Hay, minerals supplements and concentrates like dairy cubes can also be bought from the market and fed to camels. However, this can be expensive and is usually only affordable for high yielding female camels.

II. Water requirements

Compared with other livestock, the camel's body is very good at using water, as it can reabsorb most of the water in the kidney and intestines and also loses very little water through sweating.

1.8. Preparing production plan

Are you a manufacturing firm? If so, you will need a production plan to ensure that you have all the inputs for production ready at the right time to meet your product demand.

Production planning is “the administrative process that takes place within a manufacturing business and that involves making sure that sufficient raw materials, staff and other necessary items are procured and ready to create finished products according to the schedule specified”, as defined by the Business Dictionary.

A production plan serves as a guide for your company's production activities. It establishes and sequences activities which must be carried out to achieve a production target, so that all staff involved is aware of who needs to do what, when, where and how.

A production plan will help you meet product demand while minimizing production time and cost by improving process flow, reducing the waiting time between operations, and optimizing use of plant, equipment and inventory. In order to do this, you must align your production plan to your business strategy and business plan, and support production planning by coordinating with other departments, such as procurement, finance and marketing.

Five step of production plan

1. Forecast demand
2. Determine potential options for production
3. Choose the option that uses resources most effectively
4. Self-assess your performance
5. Adjust

STEP 1. Forecast the demand of your product

Estimate your demand, so that you know how many products you need to produce during a specific time period. You may have already some confirmed orders for the next couple of month, but on top of that, you need to predict how many more may come.

Different methods exist to forecast your product demand. A traditional technique to estimate product demand is based on historical information (e.g. orders placed by your customers in the past). While this is a very common method, you need to consider external and internal events in your business environment that could alter past patterns. For example, new market trends, a slowdown in the economy, or a new marketing campaign that could increase or decrease your product demand compared to what happened in the past.

STEP 2. Determine potential options for production

Determine the different production options available to meet the forecasted demand of your product. For example, if you want to produce 100 shirts, you need to use a certain number of machines, human resources, materials, and time. Different combinations of these inputs can lead to different production times and costs.

- **Start by mapping all the steps of your production process.** When doing so, take into account if tasks are sequenced or dependent on other tasks, or if they happen simultaneously or independently. Below is an example of how a simple process-mapping flowchart could look. Each box represents a task of your production process. The map of the production process will be different and unique to each company. Think about how to improve process flow by eliminating bottlenecks.

Determine the resources needed to complete each task involved in your production process.

Look at how different combination of resources lead to different production times and costs:

- **Human Resources.** Determine the number of staff that will be involved in each phase of the production process, their availability, and the cost. Make sure their time is well utilized.
- **Machinery and Equipment.** Identify the machines needed and their availability, including any maintenance or replacement that may be needed.
- **Materials.** Make a list of all the materials needed for production and how you obtain them. Assess the reliability of your suppliers, including delivery time. Having materials available when needed is crucial for the production process.
- **Inventory.** It is important that you consider how to optimize your inventory. Keeping a large inventory is expensive, but keeping a low inventory is risky if demand fluctuates on a regular basis. Having a good inventory control system in place can help your firm accommodate variations in demand and mitigate possible problems or delays that may occur during the production process. For more information about how to manage your inventory, check out the video.

STEP 3. Choose the option for production that uses the combination of resources more effectively

- Compare the cost and time of each potential production option and choose the option that uses the most efficient combination of resources and that allows you to meet product demand. The chosen option should maximize the operational capacity of your firm.

- Always make sure you can cover the costs involved in the production process (purchase of materials, office rent, payment of staff salary, leasing, etc.)
- You need to share your production plan with all the departments and staff that contribute or interact with the production process, including human resources, procurement, finances, marketing, etc. If everybody knows what to do, and what materials and equipment should be used for each task of the production process, operations will be smoother.

STEP 4. Monitor and control

You want to ensure that your plan is working in the way it is intended. Monitoring and controlling is about comparing what is happening with what should be happening. Having a control system in place helps you detect problems as soon as they occur, allowing you more time to correct before it is too late.

STEP 5. Adjust

Be prepared to adjust the plan if needed. The production plan needs to be flexible to accommodate changes in customers' demand (e.g. an important order that gets cancelled). Also, you need to take into account possible risks that may arise during the production process (e.g. a machine breaks, a worker gets sick or a supplier does not deliver on time) and have a risk mitigation plan.

Inventory is the value of materials and goods held by an organization (1) to support production (raw materials, subassemblies, work in process), (2) for support activities (repair, maintenance, consumables), or (3) for sale or customer service (merchandise, finished goods, spare parts), as defined by the Business Dictionary.

1.9. Establishing physical and financial record keeping system

Record identification criteria are used to identify different record types within a data set.

When specifying this type of criteria, first examine your data sets, and then determine what field values uniquely identify a record with a particular type. This method can be used to match

records within a data set to a particular record layout. By default, record length is used as identification criteria if nothing else has been specified.

Review your methods for recording and storing information - re-evaluate your methods, systems and procedures on a regular basis to check that they are as effective and efficient as possible.

Record information in appropriate detail - you will need to keep a different level of detail on information, depending on how significant it is and how you anticipate using it. Introduce new methods of recording and storing information as needed. Breeding and calving records should be kept systematically on a lifetime card or a wall chart or in a computer. Ideally, a herdsman's notebook should be the original source for all this data. This should be available for reference at all times in the dairy office. The data should include birth date of the animal, farm details, tag number, calf live or dead, breed, sex, calving difficulty (graded), weight, breed, one of twins, triplets, fate (i.e. for milk production, meat), dam's identification, sire's identification. It is useful for looking back at previous data according to the date. It is not so useful for looking at assembled data for individual lifetime records of an animal.

Recording by itself does not improve anything. It is not until the data are used that they will give valuable information about the animals and the herd. Accuracy in this case is essential as these records may be helpful for making decision about remedial action and future planning of herd management. This record is important input for identifying the potential for production improvement.

By keeping records, a camel keeper can monitor what is happening in the herd over time. This is important for planning. Records can be used to make decisions on future management of the herd: When to breed, which camels to keep and which to sell, when to take them to market and the quantities of milk and income that they are likely to produce. Records help the camel keeper to assess the profitability of the whole camel rearing enterprise

It is important for camel keepers to ensure the following:

- Regularly monitor the physical condition of the camel.
- Ensure that the camel has enough forage for optimal performance.
- Discuss the importance of proper selection of a good breeding animal in a herd.
- Discuss the importance of avoiding teat tying in order to prevent mastitis and loss of udder quarters.

- Discuss the importance of rehydration in camel calves with diarrhoea using a rehydration solution.

Pregnant camels should be put on good nutrition in the last three months of pregnancy as this normally translates into fast foetal growth, high birth weight and increased milk yield after birth. Further, higher birth weight of calves enhances survival, growth and production during later stages of life. Camels should get mineral supplements that are rich in essential elements and in the required quantity. Lactating camels should be watered after every 6 days to avoid dehydration, which reduces milk yield (a 29% reduction in milk yield after 8 days has been reported). Failure to observe these guidelines may lead to loss of production, especially of milk, which is very important for the pastoralist.

Self-Check -1	Written test
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Name _____ Id no _____ date _____

Directions: Answer all the questions listed below.

Test I. multiple choice

- Which camel species type is known as desert or one humped
A. Bacterian B. Lama C. Dromedary D. I. Glama
- One is not criteria to classify camels

A. coat colour B. Morphology C. Size D. locality

3. Which environment condition is suitable for camel production?

A. saline and well drained B. high rain fall
C. poorly drained D. sticky black soil

TEST II. Write short answers

- 1, what is the difference between old world and new world camels? (3 points)
- 2, Classify camels based on their coat color, locality and morphology? (3 points)
- 3, what are important criteria to classify camels? (3 points)
- 4, what are the Handling equipments of camel and their function? (2 points)

Satisfactory rating - 14 points

Unsatisfactory - below 14 points

You can ask you teacher for the copy of the correct answers.

LG#14	LO2. Select camel for milk production
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Instruction sheet

- This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:
- Determining Criteria for camel selection
- Determining and practicing Culling and replacement practices
- Preparing milking sheds; yard and equipment
- Identifying and reporting Existing hazards
- Handling lactating camel
- This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to: *Determining Criteria* for camel selection
- Determine and practice Culling and replacement practices
- Prepare milking sheds; yard and *equipment*
- Identify and report Existing *hazards*
- Handle lactating camel

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

Information Sheet 2

2.1. Determining selection criteria

Not desirable when feed supplies are limited because reproduction in the camel is adversely affected.

Objective and subjective criteria may include

- size
- age
- breed
- teeth for age and deformity
- general appearance and condition
- colours, and temperament
- disease susceptibility
- , percentage deformity
- sex growth rate
- body weight, breeding history
- growth rate, and
- Milk production and milk quality.

Maximum production efficiency is not necessarily related to maximum performance levels in all of these traits due to unfavorable genetic associations between certain traits. For example, high levels of milk production and large camel size are associated with rapid growth rate in the calf but are for age.

I. Teeth

Appearance and shape of teeth can be greatly modified by the quality of diet, nutritional deficiency, congenital malformation and dental diseases. Furthermore accumulation of tartar, discolouration and accidental loss of teeth can lead to wrong age estimation. The ‘tushes’, upper and lower canine, upper incisor 3 and upper and lower premolar 1 are very well developed in mature males. In females and geldings these teeth are less developed or even absent. For aging camels older than 12 years, one has to rely heavily on experience in judging wear of teeth, available history of the animal and good judgement of physical appearance. In addition, other guidelines such as appearance of the

animal, sexual maturity, known calvings in females, signs of advanced age such as grey hairs, scars and skin texture can reasonably help in estimating an animal's age

When records of birth date are lacking, examination of teeth is still a reliable method for estimating age. Estimation of age is based on information regarding time of eruption, shape and angle of teeth and signs of wear. Females matured at three to five years old and first calve at four to six years old. They can remain fertile up to age of 25 years.

To examine the teeth the camel's head is restrained by grasping the upper and lower lip. If need be a mouth gag may be applied. The head is then slightly pulled downward. During examination, camels usually vocalize a lot. Due to small and narrow space of the camel's oral cavity, the premolar and molar teeth are difficult to see or examine. Age determination therefore is mainly based on the appearance, shape and angle of the frontal teeth including incisors and canines. Dental Formulae: The dental formulae of the camel differ from those of true ruminants by the presence of incisors (I) in the upper jaw and of the canines (C) or tushes as they are sometimes known, in both upper and lower jaws. The formulae for the dentition of camels, including premolars (P) and molars (M) in both the deciduous and permanent teeth are:

Deciduous: $(1 \frac{1}{3} C \frac{1}{1} P \frac{3}{2}) 2 = 22$

Permanent: $(1 \frac{1}{3} C \frac{1}{1} P \frac{3}{2} M \frac{3}{3}) 2 = 34$

Estimation of the age of camels using dentition is possible, but requires some experience and skill. This is mainly because of the difficulty in distinguishing clearly between the deciduous and permanent incisors as there is not much difference in the sizes as it does exist in true ruminants.

What purpose is served by determining age of camels? Give detailed formulae for deciduous and permanent teeth in the camel. Also give the method to examine the teeth. Most camel herders will know the age of every single animal in their herds yet proper determination of age can be important when it is traded, when treated for an ailment or when a decision on breeding has to be made. When records of birth date are lacking, examination of teeth is still a reliable method for estimating age. Estimation of age is

based on information regarding time of eruption, shape and angle of teeth and signs of wear.

Examining the Teeth:

- To examine the teeth the camel's head is restrained by grasping the upper and lower lip.
- If need be a mouth gag may be applied. The head is then slightly pulled downward.
- During examination, camels usually vocalize a lot. Due to small and narrow space of the camel's oral cavity, the premolar and molar teeth are difficult to see or examine.
- Age determination therefore is mainly based on the appearance, shape and angle of the frontal teeth including incisors and canines.

Table 2.1. Development of front teeth in the lower jaw vertically

At birth	No teeth
1 month	2 pair of incisors, 3 rd pair emerges
2 month	Canine emerges
1 year	Canine and all 3 pair of incisors grown
2 year	Incisors worn and separated
3 year	Incisors well worn and separated
4 year	Incisors heavily worn, beginning to fail out
5 year	First permanent teeth(incisor 1 emerged
6 year	Permanent incisor 2 emerged and grown
7 year	Permanent incisor 3 emerged and grown , permanent canine emerged
8 year	Incisor worn, canine half grown
9 year	Incisor more worn, canine fully grown
Older camel	Teeth worn, incisor stand

Table 2.2. Age at which milk teeth and permanent appear

Teeth	Lower jaw		Upper jaw	
	Milk teeth	Permanent teeth	Milk teeth	Permanent teeth

Incisor 1	2 weeks	4.5-5 years	none	none
Incisor 2	2 weeks	5.5-6 years	none	none
Incisor 3	1-3 months	6.5-7 years	2-4 months	5.5-7 years
Canine	2-4 month	4.5-5 years	2-4 months	6-7 years
Premolar 1	1 month	6.5-7.5 years	1 month	6.5-7.5 years
Premolar 2	1 month	5-5.5 years	1 month	5-5.5 years
Premolar 3	none	none	1 month	5-5.5 years
Molar 1	none	12-15 month	none	12-15 month
Molar 2	none	2.5-3 years	none	2.5-3 years
Molar 3	none	4.5-5 years	none	4.5-5 years

II. Growth Rate

Growth rate is important because of its high association with economy of gain in relation to fixed costs.

III. Breed

Females which are medium in size, with a good general appearance and condition, disease resistant, high growth rate, high milk yield and with a good milk quality and etc will be selected for milk production purpose.

All four quarters of the udder should be well developed, distinct and evenly spaced. The teat should be large. If the animal is lactating, milk it yourself or ask the owner to do it.

Check whether she is pregnant (when approached by a bull or a man, if it lifts its tail, it is considered pregnant). Camels are accurately assessed based on selection criteria. Accuracy in these cases is essential because individual camels in a herd are often greatly misjudged unless the profitable camel is definitely identified. Indicators of good productive dairy camel are:-

- Body capacity
- Mammary system
- Dairy character

d. General appearance

The three methods for selection are

- 1) Tandem method
- 2) Independent culling method
- 3) Selection index method (the total score)

1) Tandem method

In this method, selection is practiced for only one character/trait at a time until a satisfactory level is reached, then a second character/trait is considered, later a third and so on. The efficiency of this method depends on the genetic correlations among the traits. If there is a strong positive genetic correlation among the traits, then selection for one trait would improve the correlated traits. Should there be negative correlations, b/n the traits, the subsequent selection for a second trait would nullify the progress made in the first selection.

2) Independent culling method

With independent culling method, selection may be practised for two or more traits simultaneously. For each characteristic, a culling level is established below which all individuals are culled, without any regard to their merit for other traits. This is one of the major disadvantages of this method; the superiority for one trait does not have an opportunity to offset lack of merit in any other trait. Example: A breeder has fixed a minimum standard for retention of dairy camels in the herd and those camels below the standard are culled out.

Table 2.3. Minimum** = Minimum standard for retention in the herd

Trait	Minimum**	camel	camel
-------	-----------	-------	-------

		A	B
Age at calving	50 months	48	62
Lactation length	360 days	360	360
360 d. milk yield	4800 kg	4900	5000

If the independent culling method of selection is used, camel B would be culled out of the herd b/c the age at calving was 62 months. However, the cow was much superior to cow A in its milk yield and much of its superiority could have been of genetic make-up. Therefore, in this method it is probable that some genetically superior stock could not find a place in the herd due to lack of merit in one trait.

3) Selection index method (the total score)

The animals with the highest total score are retained for breeding purposes and the poorest will be the culled. The selection index is found to be more efficient than either of the two methods. If selection index is correctly constructed, this method is most advantageous method of selection, b/c, it would allow the high superiority in one trait to patch up slight deficiencies in the other. For the construction of selection index for an animal enterprise the following information's are required:

- 1) The h^2 for each of the traits and the phenotypic variances for each trait.
- 2) The phenotypic and genetic correlations b/n the traits.
- 3) The relative net economic importance in each of the traits

By adding the score for each trait a single value (total score) is obtained which is an index of the total performance of the animal. It is then simple to list the animals in order of merit and make selection comparatively easy. Since the traits vary in importance from time to time, the weight given to each of the trait should be examined periodically and the index has to be modified to

suit the circumstances under which the animals are produced

2.2. Determining culling and replacement practices

This may include age, size, fertility history, conformation, skeletal faults, temperament, body weight and color, milk yield, growth rate, feed conversion rate, and chronic disorders. Culling rates will vary according to the production profile of the herd, affordability and availability of replacement stock and other factors. Culling of breeding females also plays a great role. Culling might be desirable from a performance-oriented point, when considering the slow herd growth in camels.

In order to make improvements in camel husbandry there is a need of basic data. These includes Camel numbers, details of administered preventative health treatments and outcomes, conformation, temperament and performance details, milk yield, bodyweight and condition scoring and any observed abnormalities. Etc. Recording provides a basis for:

- Evaluation of the animals in the herd
- Selection in the herd
- planning of mating and avoidance of inbreeding
- Replacement of stock
- planning of feeding
- Comparison of different herds

A complete and accurate dairy record is a backbone of profitable dairy farm. They are important to monitor the progress and identify problems on time in camel dairy operation before incurring much cost. Dairy records should be simple, complete, accurate, up to-date and understandable.

For good camel farm management goals have to be defined. Goals are of two types

- **Production goals:** how much should be produced
- **Efficiency goals:** how efficiently will this product be produced

Production goals may be: 100,000 litres of milk

35 calves weaned

Efficiency goals may be: 5,000 litres per camel

1 weaned calf per camel per two year.

360ys lactation period

After realistic goals have been defined, a farm can start producing. For the different parts of the enterprise, different records may be needed.

2.3. Preparing milking sheds; yard and equipment

Equipment used for milking includes

- Feed resource
- Detergents
- Weighting scale
- Coiled meter
- Site hobble ,sisal, plastic or leather rope
- Calf muzzle rope
- Halters
- Thermometer
- Knapsack sprayers.
- Restraining rope
- Storing cans
- Milk buckets
- Milking pails
- Milk pasteurizer
- Milk homogenizer

Facilities for milking operations include:

- milk harvesting equipment
- milk cooling and refrigeration equipment
- emergency drive source equipment
- yard washing equipment

- waste management system equipment
- feeding equipment
- dairy herd drenching equipment
- teat spray equipment
- hot water service
- Fly control systems.
- Milk processing equipment

Milking sheds; yard should be kept free of dangerous hazards such as nails, wire, broken glass, plastic bags, and holes in the ground and cleaned with appropriate cleaning agent.

2.4. Identifying and reporting hazards

Whenever a dairy man observes what appears to be an unsafe or harmful condition the person must report it as soon as possible to a supervisor, and the person receiving the report must investigate the reported unsafe condition or act and must ensure that any necessary corrective action is taken without delay. Hazards may include

- camel movement and handling,
- damaged yards,
- obstacles,
- uneven ground, and
- mechanical malfunctions including exposure to moving parts and hydraulics
- Moving machinery and vehicles
- Noise
- Slippery roads
- Cold weather

2.5. Handling lactating camel

During the process of handling lactating camels the following points should be remembered

- Good supervision is essential
- Avoid (minimize) stress – disturb as little as possible, avoid (minimize) bad handling, irritation by parasites, etc.
- Due attention to disease prevention measure
- Take them to better pasture / browse

2.5.1. MILK

The greatest collection of milking camels (over five million) is in Somalia and the adjoining areas of neighbouring countries. The milk of these camels is the main source of income and a key to the survival of the associated human population. Even here, where great use is made of the camel's ability to produce milk in very arid area, no selection has been made on the basis of measured milk production. Good milking camels do exist in Pakistan and some border areas of India but their potential to produce more milk has not been properly exploited. In North Eastern Africa where about two-thirds of world dromedary population is found, so great is the requirement for milk production and so low is the camel's reproductive rate that all females will be bred and milked. Culling of any animal with mammary gland seems impossible. Therefore it is not possible to apply the degree of selection pressure necessary to achieve increased production and type fixation.

No reliable work on results from selection seems to have been published. However, enough variation exists for selection to have significant benefit. Milk production for 305 days has been reported to vary from 1200 kg to 10,700 kg. It shows that given sufficient time for selection for milk yield, milk quality, less intense maternal instinct and development of management systems, camel dairying may be commercially feasible. It appears appropriate to suggest that if a milking type is to be developed, such activities will need to be carried out at appropriate institutions.

2.5.2. Frequency of milking in camel

Camels have four teats like those of buffaloes and cows. They are milked traditionally by men. Because of the height of the udder milking is done standing with one knee raised to support the milking bowl. Under most circumstances one-half of the udder is milked and the other one simultaneously suckled by the calf. Occasionally both udder halves are milked at the same time by two herdsman. Not all camels accept this, particularly during the early stages of lactation, and in most cases the calf has to suckle first to stimulate milk let-down. In later stages of lactation, it is normally sufficient that the calf is present but does not need to suckle. Sometimes, when the calf is stillborn or dies early after birth, its

skin is used to build a calf dummy that is shown to the mother to induce the release of milk. This is successful when the mother has had calves before, mostly it does not work with first calves. In many such cases the mother will simply dry up within a week. These animals are quite often immediately bred again with good success. The frequency of milking camels is variable and depends on supply and demands for milk. Several factors affect milking frequency such as season, the quantity of milk produced per animal, the number of milking camels present, availability of other food for the herder's household and sex, age and health of calves. Higher frequencies commonly produce a higher total yield, which is noticeable up to four milking a day. It is not unusual to milk camel up to six times a day.

2.5.3. Cleanliness of the milking process

Milk for human consumption must be clean, safe and free from extraneous matter, such as manure and dust. A bacterial count for *E. coli* is a good indicator of milk purity. A standard safety test for milk is measured by the presence of pathogenic microorganisms, and a good sample of milk should not contain more than 200,000 to 1,000,000 SPC/ml.

Guidelines for hygiene

The udder and teats should be washed with water (40-45°C in cooler climates or tepid water in warmer climates) and wiped dry with individual towels. All four quarters should be checked for mastitis by taking few streaks of milk in a strip cup.

A. Milkers

All the milkers must be free from contagious diseases, especially tuberculosis. Milkers should have short-cut nails, clean hands washed with soap and wiped dry, and should use the dry fist milking technique.

B. Utensils

All milking utensils should be clean, sanitized and dry. Small mouthed, dome shaped milking pails are safe and hygienic. Milk should be stored in a 50 kg can with large funnel or strainer, and covered with muslin cloth for straining.

C. Environment of the milking parlour

The milking parlour should be clean, dry and free from dust. The parlour should be peaceful, well-ventilated, fly proof and mosquito proof. Fly spray or flytraps should be used during milking and milk storage.

Milking techniques

Manual milking techniques are utilized in most developing countries, due to availability of cheap labour and low production levels of dairy animals. The following three techniques of hand milking are in practice:

1. Dry full fist/ full hand milking

In the dry full fist/full hand milking technique, the base of the teat is grasped between the thumb and forefinger, pressure is applied by the remaining fingers, and milk is forced out from the teat cistern through the streak canal. In this method, the pressure distribution on the teat is equal and it does not damage the udder tissue. The teat is always kept dry and no water or milk is applied over the teats. This is the most comfortable method of milking, both for the animals and milkers, it is also rapid and wide



Figure 2.1. Dry full fist/full hand milking.

2. Pinch or knuckling method

In the pinch or knuckling method, the teat is grasped between knuckled thumb and all the fingers. This method exerts unequal pressure on the teats and may damage the teat tissue.



Figure 2.2. Pinch or knuckling hand milking

3. Stripping technique

In the stripping technique, the teat is grasped between thumb and adjoining two fingers (fore and middle), and pressure is applied from the base of the teat downwards and the milk is withdrawn through the streak canal. This technique is used for the dairy animals with small teats, and for withdrawal of residual milk rich in fat, after full fist milking or machine milking.



Figure 2.3. Stripping technique

- **Feed requirement of lactating camel**

Feeding system for lactating camels should follow their physiological status. Camels producing milk have a need of large quantities of water (milk is about 90% water) and the main nutrient required is protein. Generally any high protein type of feed at about 250 gram per litre milk produced should be satisfactory for maintaining milk production

- **Efficiency and effectiveness of milking procedures**

Milking procedures must be monitored for efficiency and effectiveness .Incomplete milking is very dangerous to the camel as it may cause mastitis and loss to the owner as it may cause total yield reduction. Inappropriate milking procedures are also very devastating to the farm in general. Therefore, always check different milking methods and check for effectiveness. Check cleanliness of equipments, milking personnel and milking area.

Self-Check -2

Written Test

Name: _____ Id no _____ Date: _____

Directions: Answer all the questions listed below.

Test-I. Choice

1. Culling and replacement of camel is influenced by

A. fertility B. skeletal faults C. milk yield D. all

2. One is not selection criteria of camel for milk production

A. growth rate B. Breed type C. Health disorder D. High feed conversion rate

3. Factors affect lactating camel

A. stress B. pasture/ browse availability C. incomplete milking D.all

Test II: Answer all the questions listed below.

1. What are selection criteria of camel for milk production? (3)
2. Discuss about Milk production and lactation length of different camel breeds.(3)
3. What are the remembering points During the process of handling lactating camels?(3)
4. Compare feed requirements of lactating camel with dry off camel.(3)
5. What is culling and its importance? (2)

Note: Satisfactory rating -17 points and above Unsatisfactory - below 17points

- Iodine weighs scale
- Milk pail detergent
- Strip cup warm water and container
- Towel PPE
- Parlors table
- Teat dipper

2. Procedure

- Milkers should keep their fingers trimmed and maintain overall personal sanitation
- Assemble all the necessary equipments: equipments must be clean and sanitized
- Move the camel into the parlor /stanchion. Avoid shouting
- Milkers should wash the udder and teats thoroughly with clean warm sanitising Solution for 15-30 seconds. The washing procedure not only removes dirt but also initiates the milk ejection reflex
- Milkers should dry the udder using individual towels or disposable paper towel
- One or two streams of milk should drawn from each teat in to a strip cup and discarded
- Because of the height of the udder milking is done standing with one knee raised to support the milking bowl or put a raised table under the bowl
- While milking, avoid blowing noises and handling other materials
- Immediately after milking, the teats should be dipped in an effective teat dip solution and clean all milking equipments

2.2 Procedure of machine milking

1. Tools and equipment

Milker	store can
Feed	milk homogenizer
Iodine	weighs scale
Milk pail	detergent
Strip cup	warm water and container

Procedure

- Wash the udder and teats and dry teats
- Remove 1 or 2 streams of milk into strip cup or paddle for camel- side mastitis test.
- Apply milking machine within 1 minute after wash
- Machine strip only a few seconds
- Remove milking machine promptly when milk flow stops. Cessation of milk flow and collapsed pliable udder are best indicators of when the udder is milked out. Vacuum supply to the teat cups should be shut off and then the teat cups gently removed
- Apply teat dip to teats.
- Record milk weights.

2.4.Determine age of camel

1. Tools and equipment

- Restraining rope Personal protective Equipment
- Mouth gag
- Record book

Procedures

- Ear PPE
- Restrain camel head and grasp lower and upper lips
- Using mouth gag
- Push the head slightly down ward
- Examine by looking at appearance shape and angle teeth including canine and incisors



LAP TEST-2

Performance Test

Name..... ID Date.....

Time started: _____ Time finished: _____

1. Instructions: Given necessary templates, tools and materials you are required to perform selection of camel for milk production, hand milk and machine milking of camel

Perform the following tasks within **1** hour. The project is expected from each student to do it.

Task I: Perform selection of camel for milk production

Task II: Perform hand milking of camel

Task III: Perform machine milking of camel

Task IV. Estimate camel age

LG#15	LO#3. Identify Camel reproduction requirements
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Instruction sheet	
<ul style="list-style-type: none"> • This learning guide is developed to provide you the necessary information regarding the following content coverage and topics: Identifying Sign of puberty and sexual maturity • Identifying behavioural and physiological sign of rutting. • Identifying breeding season. • Determining body Condition of camels. • Checking for signs of infection • Identified receptive females. • Handling mating procedures. • Supervising field mating. • Undertaken pregnancy testing. • Recording records of mating • Identified abnormal, normal and difficultness <p>This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:</p> <ul style="list-style-type: none"> • Identify Sign of puberty and sexual maturity • Identify behavioural and physiological sign of rutting. • Identify breeding season. • Determine body Condition of camels. • Check for signs of infection • Identify receptive females. • Handle mating procedures. 	

- Supervise field mating.
- Undertake pregnancy testing.
- Recording records of mating
- Identified abnormal, normal and difficultness

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

Information Sheet 3

3.1. Identifying sign of puberty and sexual maturity

- **Puberty** - is the age at which an animal first becomes capable of reproduction while
- **Sexual maturity** is the condition where by this capability of reproduction increased to the optimum level.

Camel has slow growth rate genetically and this genetic handicap together with lack of feed supplementation under pastoral management systems results in delayed ages at puberty for the dromedary. Age of sexual maturity of dromedaries is at 3 years in some places and 5 years in others. However, males are allowed to give service at the age of 6 years and females are allowed to breed at the age of 4- 6 years and age at first calving is 5-7 years since gestation period is about one year. Age at first calving is much later than in cows. Puberty is time of sexual maturity, when animal becomes capable of propagating its species. Sexual maturity is often related to physical maturity.

Under most conditions male camels reach puberty as early as 3 years, but their full reproductive powers are not well developed nor they normally used until they are 5 to 6 years old. Their sexual abilities remain more or less constant until they are 18 to 20 years old. Female camels are normally mature at 3 years of age, but they are not generally bred until they are 4 years old. They may continue to breed until they are over 20 years old.

Table: 3. 1. Age at sexual maturity of male and female camel

Maturity	Male	Female
Sexual	3 years	3 years
Physical	5-6 years	4 years

- **Signs of puberty**

- ✓ A spectacular increase in weight and volume of testes

- ✓ Sexual excitement or libido is high
- ✓ Increase in weight and age of camel

3.2. Identifying sign of rutting and behavioral change

Onset and length of rutting

Rut - is the physical and physiological sign of sexual activity in a male camel. Male camels show a strong “rut” when they are ready for breeding, at sexual maturity and at various times of the year. Though the onset of the season in both males and females is hormonally controlled, all the external factors that initiate hormonal activity have not yet been determined. The intensity of the rut usually varies seasonally.

The average duration of rut is about 3 months. It is affected both by age and nutrition. Older males may continue in rut throughout the year and in the case of well-fed younger animals rut may last for up to 5 months. When driven to hard work the male camel’s sexual inclinations may diminish or disappear. There appears to be very considerable geographical variation in the breeding season of camels.

- **Signs of rut**

Heavy and strong (and therefore usually older) males are often dominant over smaller and weaker males. Dominant males attack those lower down the pecking order, or subordinate animals, which then lose libido and go out of rut. The common signs of rut are:-

- Change in behaviour that results in being aggressive to other animals, to its handlers
- Grinding his teeth, waves head and neck about
- Move restlessly and lashes the tail
- Frothy discharge from the mouth
- Urinate frequently with the urine being splashed about the camel and anything close to it by the tail
- Loss of appetite
- Gargling sound – attractive sound to females
- Exudation of pool glands (red/pink sac) in dromedary and extension of soft pallet "dulaa" in Bactrian camel is typical characteristic of feature

The physiological changes associated with the physical signs of rut are :-

- Increase in androgens in the blood.
- The poll glands in male camels increase in size during the rut and secrete a sticky fluid, which has an androgen concentration similar to that of the blood.
- These secretions are often the first signs that mating season is approaching and can help a handler to begin to prepare his herd for mating.

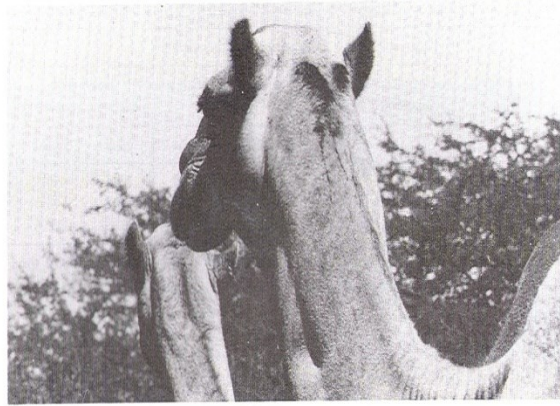


Fig 5.2 Poll glands of a male camel showing typical exudation during the rut

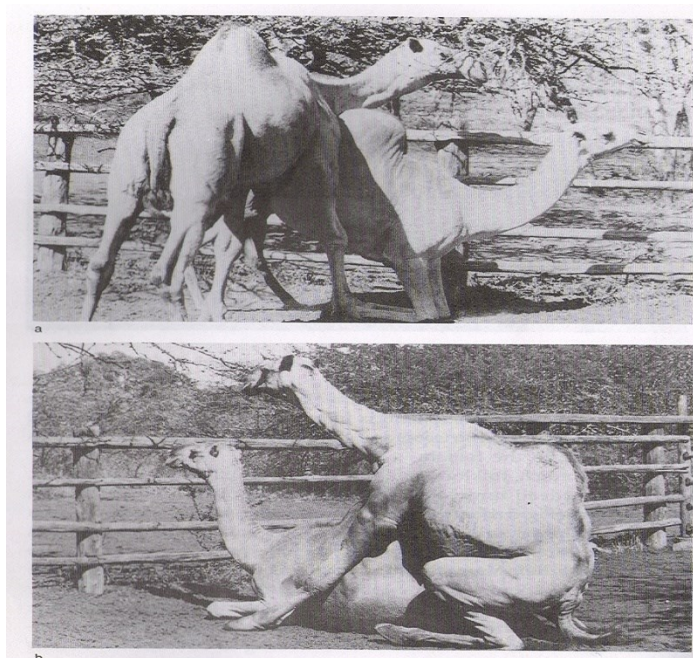


Figure 3.2 .Mating behaviors of camel

3.3. Anatomy and physiology of camel reproductive system

3.3.1. Anatomy of the male external genital

a. Scrotum and Testes

The scrotum is located in the perineal region in camels with the testicles directed caudo-dorsally. The scrotal skin tends to be smooth and fine during the height of breeding activity and then becomes thicker during the period of sexual inactivity because of decreased testicular size. The testes of camels are ovoid in shape and are usually descended at birth but are very small. They increase in size at the onset of puberty but there has been a wide variation in the dimensions reported.

This is probably due to differences in age, breed and sexual activity at the time of measuring, but in general they vary in length from 7 - 10 cm and weigh between 80 - 100 g each.

They become enlarged and protrude when the male camels are sexually active in the rutting season. Testicular size is an important parameter in the evaluation of the breeding potential of males and can be used to predict daily sperm production because of the high correlation found between scrotal measurements testicular weight and total sperm production.

b. Seminiferous tubules

In camels the outer diameter of the seminiferous tubules has been reported to vary between 113 - 250 μm in diameter and gets significantly smaller during the non-rutting season. The season does not however have any effect on the size of the spermatozoa although it does on their number.

c. Epididymis

As in other species the epididymis is composed of three distinct parts: the caput (head), the corpus (body) and cauda (tail). It is located along the dorsal border of the testis with the head curving around the cranial pole of the testis. In dromedaries, the cauda epididymis is round and well-protruded about 3 - 4 cm above the respective extremity of the testis.

Ductus deferens - The ductus (or vas) deferens is very long measuring between 45 - 50 cm in length and is enclosed within the spermatic cord.

d. Prepuce and penis

The prepuce is flattened from side to side and triangular in shape when viewed laterally. In the absence of sexual arousal, the small preputial opening is directed caudally and because of this they urinate towards the rear, but when erection of the penis occurs, the cranial prepucial muscles pull the prepuce, and also the penis, forward from their backward position. The penis is attached to the prepuce at birth and does not become free until 2 - 3 years of age.

Anatomy of the male genitalia.

- Ureter,
- Ductus deferens,
- Urinary bladder,
- Prostate,
- Urethral muscle,
- Ischiocavernosus muscle,
- Retractor penis muscle,
- bulbospongiosus muscle,
- crus penis,
- ischiocavernosus muscle,
- Retractor penis,

- Sigmoid flexure,
- Penis.

The penis of the camel is of the fibroelastic type and relies primarily on its elasticity for erection and extension. In the absence of an erection, the penis is retracted into its sheath via a prescrotal sigmoid flexure not a post scrotal sigmoid flexure. The length of the penis ranges from 59 - 68 cm and it is cylindrical in shape

3.3.2. Anatomy of the Female Camel

Anatomy of Internal Genitalia

The Ovary

The ovaries are located about 36 cm from the opening of the vulva but are subject to great variations depending on the physiological stage. For example, during pregnancy they become more ventral and are pulled forward during the advancing stages thus making them very difficult to palpate.

The left ovary is generally more cranio-ventral in position than the right ovary. The ovary is attached to the broad ligament by a well-defined strong ligament which extends from the hilus of the ovary to the tip of the corresponding uterine horn. Both ovaries are enclosed within a fold of the mesosalpinx known as the ovarian bursa, the apex of this bursa forms a large circular orifice within which lies the fimbriae of the oviduct.

Their general appearance and size varies according to the age and activity of the animal. In the prepubertal animals they have a smooth and glistening surface with several raised small vesicles (2 - 5 mm in diameter) throughout the surface which correspond to the follicles. The measurements given for the ovary vary from 2.6 - 6 cm in length, 2 - 4 cm in width and 0.5 - 0.9 cm in thickness and each ovary weighs between 3 - 4 g in dromedaries and approximately 5 g in Bactrians.

Ovarian Structures

The ovary consists of two major parts

- (i) the cortex and
- (ii) The medulla and the whole organ is enclosed by a tunica albuginea except in the area of the hilus.

1. Follicles:

Follicular activity is dominated by 4 types of follicles, namely:

- i) small growing follicles,
- ii) mature follicles,
- iii) regressing follicles or over-large, anovulatory follicles

2. Oviducts

As in other mammalian species the oviducts play an important role in storage of sperm, fertilization and early embryonic development. Unlike other mammals though the oviducts are enlarged at the uterine end and this unique arrangement allows prolonged storage of large numbers of spermatozoa. The oviducts measure between 17 - 28 cm in length

3. Uterus

The uterus in all camelidae is bicornuate with the left horn being distinctly longer than the right. In nulliparous females the uterus is very small and can be found entirely within the pelvic cavity, whereas in mature non-pregnant females it is located in the abdominal cavity.

In dromedaries the non-gravid uterus has a short body of only 2 - 3.5 cm in length and the horns vary between 6 - 10 cm right and 8 - 15 cm left. In Bactrians the body of the uterus can be as long as 8.5 - 9.5 cm in length and the right and left horns measure between 6 - 8 cm and 8 - 12 cm respectively.

4. Cervix

The cervix of the dromedary has between 3 and 6 annular muscosal folds but its consistency does not differ significantly from that of the uterus, unlike that of cattle, which makes it very difficult to identify by rectal palpation. In camels the cervical canal varies between 4 - 6 cm in length and 3.5 - 6.1 cm in diameter during follicular activity, but these decrease slightly during ovarian inactivity. The cervix protrudes caudally in the vaginal cavity forming a fornix of variable depth (1 - 1.5 cm). During pregnancy the cervix becomes very tight and in the advanced stages the cervix is pulled forward and downward beyond the pelvic brim. The normal size and position of the cervix is regained within the first two weeks following parturition.

5. The Vagina

The vagina is some 25 - 30 cm in length and is lined with many longitudinal folds. The anterior vagina and the vestibulum are separated by a strong band of tissue (vestibulum sphincter muscle) and the hymen. This structure is very tight in nulliparous or young animals and can make manual examination of the vaginal cavity very difficult.

6. The Vulva

The vulva opens directly below the anus and measures 6 - 7 cm in length. During the follicular phase oedema of the vulva can be present but it is very discrete, however, during the last week prepartum it becomes much more relaxed and oedematous. The clitoris is very small and there is no distinct clitoral fossa. The urethra is also short and the opening of the urinary meatus is small.

3.4. Identifying type of mating system and different physiological condition of camel

Physical maturity is the term used to denote that the animal is physically large enough to cope with both the pregnancy and the rearing of calve. Both male and female should be used for mating during physical maturity.

If males mated before physical maturity the quality of the sperm may be poor, the animal will be inexperienced at mating or exhaust the animal and reduce the ultimate size and fertility. Generally there are two types of mating systems.

- a. Natural service (bull service, natural mating) and
- b. Artificial insemination.

The selection of mating system depends on service cost, availability of trained manpower and resource, health, feeding and management.

Natural service

The selection of a suitable bull is very important as it is said a sire is “half the herd”, that is half the inherited characteristics of all the calves are obtained from him. Natural service is the natural way to get pregnancy. Advantages of natural service are easy heat detection and the cost of keeping the bull is low. On the contrary the disadvantages of natural service is risk of spreading diseases and bulls have to be exchanged frequently (at about every 3 years) to avoid inbreeding

Artificial Insemination

AI has been used successfully in both one humped and two humped camels, but still presents some practical problems on large-scale application because of the difficulties of inducing ovulation and maintaining semen quality in frozen serves.

Advantages of AI

- Pregnancy can be achieved conveniently and safely
- The breeding process is effective
- The spreading of venereal disease is prevented

Disadvantages of AI

- It may be the means of spreading disease much faster and over a wide area than with natural service
- Inbreeding
- Expensive - AI needs equipments, well-trained technician, liquid nitrogen and frozen semen, transportation facilities etc.

3.5. Identifying breeding season

Breeding season

Follicular wave activity occurs all the year round but length of the whole wave, the phasing and the duration of estrus vary considerably. In areas where there are marked weather changes among the seasons follicular activity is at the greatest in winter and spring and the total cycle is longer at this period. During the summer, mature follicles are found in only a few animals (i.e. the phase lasts only a very short time) and the growing follicular stage is relatively long. It is almost certain that the long cycles are associated with environmental conditions like lower temperature and better nutrition.

In terms of practical herd management the chances of successful pregnancy are best at winter and spring. The mating season can be prolonged or even made to year round if feeding and other management factors are adjusted to ensure that the conditions are appropriate for the long cycles. Decisions on breeding seasons are influenced by feed availability at different seasons of the year, extra fed production opportunity and natural seasonal breeding behavior of camel.

- Camels are seasonal breeders
- The breeding season coincides with the cool rainy period of the year
- Release of the egg (ovulation) in females is initiated (induced) by mating. This means conception only take place during the second mating which should take place after 21 - 23 days when the heat cycle returns.

Good breeding bull

- Fast growing rate
- Good body conformation (tall, large body frame, good ability to chase and mount females, up right in standing, and well built.)
- Adapt well to the environment
- Mother of the bull is very good milker

Good breeding females

- History of producing high milk volume
- Adapt well to environment
- Good body conformation
- Large and well set udder
- Good fertility and mothering ability

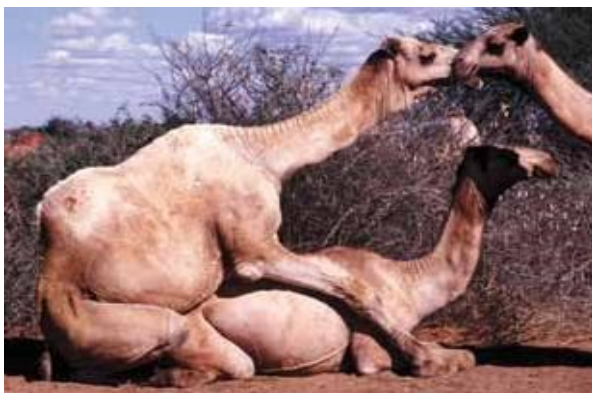


Figure 3.3. Camels at mating

3.6. Determining body condition scores of camels

Include: age; condition scoring; physical observation, and pregnancy status or lactation .It is not advisable to use camels for breeding until they are at least four years old.

The hump score has to be in the range of 3&4 which indicate good development and it should not be very big which shows that a male is a poor breeder (probably no rut) and that a female is sterile. Those camels which are emaciated, weak and unhealthy should not be selected for mating during physical observation as they are not fit for mating. Lactating camels should be scored regularly to reflect changes in fat reserves in each stage of lactation accordingly they can be abstained from mating. Pregnant camels should not be bred again.

3.7. Checking camels for signs of infection

Congenital defects are ectopiacordis (a closure defect of the ventral body wall during foetus development), Parrot mouth (in this condition the mandibulais shorter than the maxilla; affected

animal may have grazing problem), Short digit (in this condition the animal has short end digital bone(s) leading to impaired walking and idiopathic alopecia (almost complete baldness). These conditions occur rarely and thus considered of little economic importance.

3.8. Identifying receptive females

- Receptive females will sit in the cushy position
- Non-receptive females may spit and run away or refuse to sit in the Cush position, becoming agitated.

Recipient Preparation: recipients should be selected from young camels, preferably from maidens, that have uteri free from all pathology. Parallel with the SO of the donors, the recipients are given 100 mg of natural progesterone in oil once a day (e.g. Bomagest E; Progesterone; Progestin) for 10 days followed by Pregnenol, 1500 to 2000 IU and 2 ml of Estrumate on day 11. This is done to ensure creation of follicles and hence a CL (the better the luteal material, the better are the chances of pregnancy). Ovulation and luteinisation is induced in the recipients by giving them Chorulon, 3000 IU IV, 24 hours after the donors receive the same. Thus an attempt is made to have CL's in the recipients that are one day younger than those in the donor. Best results have been achieved when the matching of recipient to donor is minus 12 to 36 hours.

The external symptoms of this condition are the female seeks out a male and stands beside him, becomes restless and is very ready to be mounted, bleat frequently or even continuously, the tail is lifted and waved about and small quantities of urine are passed frequently, the vulva, the lips of which are swollen, is opened and closed irregularly and emits a foul smelling mucus (foul smelling to humans and is a very attractive scent to male camels), the vagina is pink-coloured and moist, although the degree of wetness decreases as heat progress Vaginal examination shows that the cervix is moist and relaxed. Rectal examination shows uterine horns are swollen at the beginning of heat, although not so much as in the cow. Females that are not in heat do not mount others in heat, but they will run after them in playful manner and attempt to bite their vulva.

Fertilization rate

The fertilization rate of camels is considered very low. Fifty percent fertility, or even less, has been recorded. Repeated mating was often due to improper development of follicles.

3.9. Using mating procedures and handling techniques

Before mating the male sniffs and bites the vulva and other parts of the body of the female prior to attempting to copulate with her. During mating the male rotates his penis until the vulva is found and does not thrust into female in violent manner during intercourse. The whole sex act lasts as long as 35 minutes and usually consists of several entries and males may exhaust themselves on one female if handler does not remove them. Both sexes are noisy during the act and males particularly so. Generally the sexual act is in unusual position for domestic animals. It takes place with the female on the ground. Mating procedures and handling techniques should be used that minimize stress and discomfort to camels and meet occupational health and safety (OHS) and camel welfare requirements.

To keep a rutting bull from fighting other males and from wandering off in search of females in other herds, his forelegs are tied together with a short rope just above the fetlocks, efficiently restricting him to very short strides. Sometimes the ankle ropes are secured to the ground to further restrict the movements of the animal.

3.10. Supervising field mating and undertaking intervention

Field mating has to be supervised by the manager and, when required, intervention is undertaken or obtained to maximize conception rates.

The intervention includes assisting camels in the joining process using methods such as:

- Checking for an intact hymen
- Guiding and/or helping to position male correctly
- Seek veterinary advice

3.11. Undertaking pregnancy testing

May include,

- Palpation, spit offs
- Ultrasound, urine test

It has a range of 370 to 405 days with an average of 388 days.

The period of gestation for female calves averages at 390 days, while for males 385 days.

Lower limit for survival of foetus is 350 days. Calves born at or just before this time may appear weak but otherwise normal for the first 24 hours post partum but then go into irreversible decline surviving only for 2 to 3 days. Average pregnancy duration in the Bactrian is about 400 days.

Signs of Pregnancy and Diagnosis:

An evident sign is that the pregnant female is no longer receptive to the male. She will try to repulse close male attention by biting. A pregnant dromedary exhibits the tail up reflex after about 15 days. The reflex can vary in intensity from a tail held just above horizontal to an almost vertical tail, exhibiting tremor. The reflex is elicited by the approach of a male. The inexperienced observer can confuse the reflex with a tail up response to fear. The tail up response due to fear usually has no tremor. The true tail up reflex appears to depend upon the presence of a corpus luteum. It is also present in a female treated with hCG (human origin chorionic gonadotropin) and in females treated with natural progesterone, 100 g once daily for more than 4 days. When hormonally induced, the reflex does not persist for more than 18 to 20 days. Accurate diagnosis is based upon manual and/or ultrasonic examination per-rectum. Manual examination can be performed in the dromedary at 45 to 50 days and in the Bactrian at 30 days. Workers at the SCRC (Dubai) have recently established the Ultrasonography appearance of the gravid uterus and foetal structures from 17 to 320 days of pregnancy, using a 5MHz probe on an Aloka machine. Pregnancy can be diagnosed as early as 17 to 18 days when a non-echogenic space (fluid filled) 10 to 15 mm long and 4 to 6 mm wide will be seen. At 20 days, the embryo within its spherical, fluid filled yolk sac can be seen and the heart beat is discernible. At 26 days the conceptus occupies the entire left horn and the allantois is visible. The enlarging allantois forces the embryo dorsally within the vesicle until the 35th day, after which the yolk sac is sufficiently incorporated in the developing umbilical cord to allow the foetus to move towards the

ventral uterine wall again. Blood progesterone assay has also been used for pregnancy testing in the dromedary. Persistence of a level $>1\text{ng/ml}$ after day 12 (post mating) is considered a strong indication of pregnancy. Generally, however, progesterone assay has a limited application in reproductive management in the dromedary. The birth of twins is rather rare in camels (Manefield and Tinson, 1997)

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3.12. Recording mating data

Record information in appropriate detail - you will need to keep a different level of detail on information, depending on how significant it is and how you anticipate using it. Introduce new methods of recording and storing information as needed. Breeding and calving records should be kept systematically on a lifetime card or a wall chart or in a computer. Ideally, a herdsman's notebook should be the original source for all this data.

This should be available for reference at all times in the dairy office. The data should include birth date of the animal, farm details, tag number, calf live or dead, breed, sex, calving difficulty (graded), weight, breed, one of twins, triplets, fate (i.e. for milk production, meat), dam's

identification, sire's identification. It is useful for looking back at previous data according to the date. It is not so useful for looking at assembled data for individual lifetime records of an animal.

Recording by itself does not improve anything. It is not until the data are used that they will give valuable information about the animals and the herd. Accuracy in this case is essential as these records may be helpful for making decision about remedial action and future planning of herd management. This record is important input for identifying the potential for production improvement.

Mating records document the productivity of the mating stock. Mating records should include

- the name or identification number of the male and
- the breeding date
- In the breeding female identity record,
- data like bull no,
- 1st service and 2nd service, etc are documented.

Poor female camel may be sold after 3 services; good producers may be given a few services more.

3.13. Identifying abnormal, normal and difficultness of husbandry activities

Immediately before parturition the uterus begins to contract, at first only a little and may continue for several hours. Parturition time lasts about 5 to 6 hours. Parturition takes place in three phases. They are opening phase, pushing phase and delivery of after birth.

During delivery there are normal and abnormal presentations.

- Normal presentations are head first (head and both forelegs appearing first) or breech (both hind legs appearing first).
- In abnormal presentations or mal presentations only one front leg may appear or the forelegs appear without the head or only the head appears or the tail appears first or only

one hind leg appear etc. In any abnormal presentations and uterine prolapse veterinary assistance should be sought.

Due to some environmental condition and abnormal behavior camel show sign of difficulties like

- cold stress and dehydration
- Eye discharge and crying
- Head rubbing
- Infections
- Lameness
- Separation from the herd
- Unusual rising and falling

Self-Check -3	Written Test
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Name: _____ Id _____ Date: _____

Directions: Answer all the questions listed below.

Test I. Multiple choices

- First age at which a camel is capable of reproduction
 - sexual maturity
 - puberty
 - mating
 - mating
- One is not characteristic of good breeding bulls
 - fast grower
 - good body conformation
 - low ability to mount
 - well adapt to environment
- Which of the following factor affect breeding of camel?
 - feed availability
 - environmental condition
 - follicular growth
 - all
- Which presentation is abnormal during parturition?
 - head and foreleg appear first
 - both hind leg comes
 - only fore leg comes
 - Tail in between hind leg appear

Test II. Answer all the questions listed below.

- Define puberty and sexual maturity of camel (4pt)
- Describe the behavioral change of camel associated with rut (2pt)
- Write the physiological changes associated with the physical signs of rut (2pt)
- What type of sign is visible at the time of approaching parturition? (3)
- Discuss about normal delivery of calves during parturition. (2)

Note: satisfactory rating 17 and above Unsatisfactory below 17 points

Operation Sheet – 3

Procedures to score body condition of camel

1. Tools and equipment's

- Rope
- Heart girth
- Record book/note book
- Crush

2. Procedures

- Collect animals which have different body condition
- Observe the body part of the animal
- Give score for hump
- Record any observed and measured data's
- Compare and contrast from another animal Conclude the body condition of the animal by using prepared scoring rank

2.1. Technique to assist camel mating

1. Tools and equipment's

- PPE Rope
- Crush Breeding male OR Female

2. Procedures

- Put on /wear your protective clothes
- Prepare favourable ground mating by disposing any solid waste from mating area
- Grasp the body of penis
- Guide the penis inside the vulva
- Remove them apart after satisfactory sexual intercourse, if require



LAP TEST-3

Performance Test

Name..... ID Date.....

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **1:30 hour**. The project is expected from each student to do it.

Task 1: Perform body condition score of camel

Task 2: undertake assist camel mating

LG# 16	LO#4. Undertake camel raising work
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Instruction sheet	
<p>This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:</p> <ul style="list-style-type: none"> • Providing Instructions and directions • Undertaking Raising activities <p>This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:</p> <ul style="list-style-type: none"> • Provide instructions and directions • undertake Raising activities 	
Learning Instructions:	
<ol style="list-style-type: none"> 1. Read the specific objectives of this Learning Guide. 2. Follow the instructions described below. 3. Read the information written in the information Sheets 4. Accomplish the Self-checks 5. Perform Operation Sheets 6. Do the “LAP test” 	

Information Sheet 4

4.1. Providing instruction and directions to be followed

Orientation / Direction

Orientation is the position of your home in relation to the path of the sun and the prevailing wind in your region.

Because the path of the sun is to the north, orientation is usually about whether the living areas of home face north. This is because north-facing rooms receive sun for the longest period of the day in winter and are easily shaded by the eaves of the roof in summer. Warm humid climates (coastal locations above the Tropic of Capricorn) are the exception, where orientation is about access to cooling breezes and shade. Good orientation can significantly improve your comfort and reduce your heating and cooling needs. The best orientation for farm is the one that suits your climate zone.

Identify your climate zone to see whether you need to focus on orientating your farm for passive heating, passive cooling, or both. You can also do more detailed research on your region and site to find out about local weather patterns and prevailing breezes. Orientation for passive heating aims to maximise northern exposure of walls and windows, while reducing east and west exposure to avoid overheating in summer.

Orientation for passive cooling aims to eliminate solar access with appropriate shading (especially to the east and west), and maximize access to cooling breezes. Orientation for warming in winter and cooling in summer aims to maximize northern exposure of walls and windows, but block solar access with appropriate eaves and other shading in summer.

Good orientation can be achieved on almost any block, even small blocks, with careful design. Good orientation is best achieved when you are buying or building a farm, but some improvements can be made through renovation.

4.2. Undertaking raising activities

Basic camel raising activities includes:-

Animal husbandry covers a variety of subjects which have direct or indirect impact on the final product.

- Breeding
- Feeding
- Housing
- Disease control and care all affect the growth and production of animals.
- Husbandry has been based on superstition and practices handed down by father to son over the ages. Customs regarding the ownership of camels; who is allowed to graze them; and even watering have been ingrained in the culture of the various nomadic people.

Production systems

Production systems involving camels have traditionally been very extensive and mobile.

The following systems are in use:

- **Traditional system(extensive)**
- **Periurban system**
- **Ranching, and**
- **Research station**

1. Traditional system (extensive)

Is mainly subsistence oriented? Camel products are principally consumed in the family or used to bring in small amounts of cash where the situation allows. There is some exchange of products for cereals and other basic foodstuffs. In most societies old and barren animals are slaughtered. Where milk is the main product and males are not much in demand for transport, breeding or racing, they are sold for slaughter and there is thus a preponderance of females in the herd. Where the transport role is still important, more camels are kept and there will be as many males as females in the herd. Camels are also used in many societies for lifting water from deep wells for other stock and the household needs. Camel milk usually contributes more to the total milk supply from all species in the dry than in the wet season

There is sparse woody vegetation of low thorny shrubs but this is rather thicker in some areas. Several species of Acacia are dominant. Ground cover is mainly sparse ephemeral grasses with some herbs. During drought periods the pastoralists move to surrounding colonized areas in search of water and animal feed. In case of prolonged drought, state agencies and social organizations arrange to provide water and fodder through rail and road. Also, foodstuffs for herders and families are provided using helicopters. Severe droughts take a heavy toll of animal life especially cattle, sheep and to some extent goats and camels. The system is totally pastoral. All income is derived from livestock and its products such as wool, hair and butter oil (Ghee) made from cow milk. There is now also some income from off farm work and especially from the sale of labour. Concerned state agencies are trying hard to provide more water holes, roads and mobile health clinics for humans as well as animals in those areas. At some suitable places, the nomadic pastoralists have been allotted free of cost land to induce them towards sedentarisation.

2. Semi intensive (periurban system of camel production)

Periurban system is intermediate in nature and will probably gradually be displaced to more and more distant suburbs and eventually return to rural areas. Their management there will benefit from the techniques such as feeding systems, general management and milking practices learnt in the town systems. In the meantime they are an effective way of supplying increasing urban demand for livestock products in a relatively efficient way using local resources. Periurban system is a special type of transitional system which indicates that camel systems have not remained isolated from the pressures of twenty-first century. Efforts have been made in certain parts of Africa and Asia to form cooperatives and owners associations with a view to improve camel production and to inculcate in producers some political and economic awareness. Similarly, there are several mobile periurban camel dairies in the suburbs of big cities such as Faisalabad, Lahore, Multan and Hyderabad, consisting of 5 to 10 camels each. The women of camel herders each carrying about 15 litres of milk move about in the city suburbs like hawkers and sell their milk. The camel dairies move from one suburb to another and then may shift to another city. There are periurban camel dairies in Africa in Djibouti, Mauritania, Morocco, Somalia and Sudan. The system, however, seems transitional, in

that it will not be sustainable in the long run since urban populations increase and environmental concerns become more important. In Mogadishu women sell a combined total of as much as 5000 litres milk per day. The drift to urban areas has increased manifold in recent years, resulting in profound changes in lifestyles coupled with willingness to enter into new systems of production. It is accompanied by changes in animal management, nutrition, health interventions and attitudes to commercial production. These changes are often at the expense of cultural and traditional family ties and mutual help.

3. Ranching of camels in the commercial sense is a new system of camel production although it is still relatively rare. Ranching of camels is in operation in north-central Kenya where camels literally add more than one new dimension to the system. They add a vertical dimension because they are able to make use of the upper layers of the thornbush savannah that cattle and sheep and even goats are unable to convert into animal protein. They add a horizontal dimension in further diversifying the risk of failure from the normal meat-producing operations due to drought, feed or water shortages. Yet another measure is added to the opportunity to generate more income through tourist use for trekking or adventure holidays. Camels were first used in a limited way on Kenya ranches to transport water for young stock and for the herdsmen and to provide milk for the herdsmen so that they would not compete with cattle calves and thus reduce their growth rate. It was soon realised, however, that camels could play a full economic role in the operation. They allowed the total domestic herbivore biomass to be substantially increased without putting pressure on the real carrying capacity of the land. The ranch camels are now an integral part of the commercial operation. Superior bulls have been imported from Pakistan to improve milk production. Meat supplies can be guaranteed over a longer period. Adventure trekking holidays are provided for local tourists. Camels are in use for experimental purposes by the university, animal health service and by one major international organisation. Genuinely improved animals have been sold back to the original pastoral. The new commitment to the camel is evident from the increasing interest shown by a number of countries where university camel herds or national herds have been established. India probably is at the top of the list where the National Research Center on Camel in Bikaner was established in 1984 with full financial support of Government.

Well managed research centers with adequate numbers of animals are in a better position to do strategic and applied research that is not possible in traditional herds. Examples of such work are genetic typing and improvement for the desired production traits and the relationship between physiological parameters and productivity, but the small numbers of camels on most research farms/stations mean that progress in camel genetic improvement will be slow. Very useful work has been done on the relations between work and certain physiological

parameters (Figure 21). In terms of reproductive performance, age at first service was reduced from 1390 ± 36 days during 1961-85 to 1109 ± 36 days in 1986-90 in part due to selection for the character and in part due to better management. Age at first calving was reduced from about 5 to 4 years and calving intervals were shortened by about 8%. Heritability estimates have been obtained for these traits and for those related to weight and these can be used to achieve further rapid gains. Dr. R.T. Wilson (1998) has given a very pertinent suggestion about research, “The danger with camel research on station, as also with other species, is that it often provides intellectual satisfaction to the scientist but does little to improve the lot of camels and their owners in the real world. Care must be placed around the cranial part of the neck in such a manner that a clenched fist may still pass through.

4.2.1. Control, sort and restraining procedures

Before implementing procedures to control and sort camels they should be classified according to age, sex and husbandry tasks to be performed.

Procedures implemented to control and sort camels are:-

- Allowing a reasonable amount of time for camels to complete movement
- Appropriate use of handling equipment with minimum force
- Use of positive and calming techniques to foster the physical and mental wellbeing of camels.

The above procedures are conducted with due care in accordance with OHS and animal welfare requirements. From among the various restraining methods which one to use depends on the treatment, the camel’s training and temperament and its relationship with its handler?

A well trained camel needs to be restrained only by holding its head rope or nose-peg. If directed to lie down it will do so. Restrain a small camel by holding its upper and lower lips with both hands and turning its head to one side. If the camel is somewhat trained and the handler is an experienced person, this should suffice when giving an injection. If necessary a second person can hold the camel by its ears.

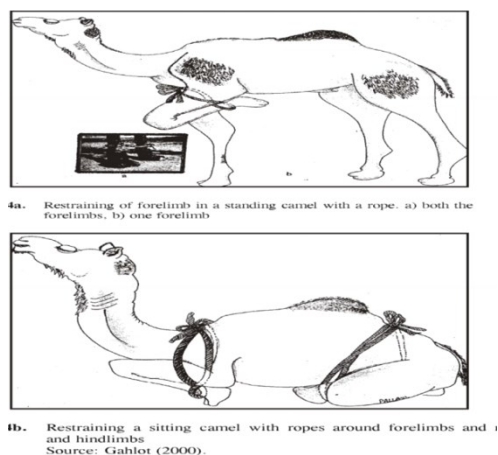


Figure 4.1 Camel restraining

A. Castration

Castration of males not required for breeding is an important management tool for most species of domestic animals. Most traditional owners of camels do not castrate their male animals; they probably think that it makes camels weak. There are, however, certain advantages in castrating animals in both traditional and modern herds. Castration prevents the production of male hormones of testes origin and thus eliminates the aggressiveness associated with ‘maleness’. Castrated males are therefore easier to manage in physical terms. They can be kept in herd of entire males or in female herds since neither they fight with entire males nor they can cause unwanted or out-of-season pregnancies.

Castrated males also usually have better carcass composition than those of entire animals and the taint or smell that is present in meat from older male animals is not a problem (yet to be confirmed). Because male camels attain sexual maturity beyond two years age, thus there is no need to castrate them at a very young age. In this way the more

rapid growth of entire male animals is conserved as long as possible. Some of the methods of castration used in other domestic species are not appropriate for camels. If they are not castrated until they are almost adult then it is clear that elastrator or rubber ring method cannot be used. In addition, because of the arrangement of the scrotum high up between the legs, the fact that it is not distinctly divided into two separate compartments and because of its shape, the burdizzo or bloodless castrator cannot be used either.

Surgical removal of the testes is thus the only way that (except by chemical means which are also not appropriate or generally practical in commercial herds) camels can be castrated. If castration is carried out at two years age or more as recommended, the animal will need to be restrained in a crush or tied down. The camel should also be sedated using a sedative or a combination of sedatives such as a mixture of chlorpromazine (2 mg/kg) + pentazocine (2 mg/kg) appears to be satisfactory for general anaesthesia (better follow the instructions of the manufacturer). A local anaesthesia, following the recommended practice for it, should also be used around the area of the scrotum. The operator and all the equipment he uses, plus the surrounding area, should be clean. The operation is best one on a clean canvas laid out for the purpose. The scrotum itself should be cleaned with alcohol or a disinfectant. One handler should squeeze the front of the scrotum to force the testicles to the back.

The other handler should make as small a cut as possible in the back of the scrotum to expose the testicle. The cord leading to the scrotum and the arteries and veins supplying blood to the testicles should then be cut cleanly. The operation is repeated for the second testicle. There is no need to stitch the wound but antiseptic and antibiotic powder should be liberally sprinkled on it. If possible, castrated animals should be kept in clean surroundings including clean pasture and disturbed as little as possible until the wound has healed. They need to be inspected to ensure that the wound does not become infected or attacked by maggot flies. If there is any sign of infection, remedial action including cleaning the affected tissue again and perhaps injection of a systemic antibiotic may be needed.

B .Training camels

Mounting and dismounting the camel in couched position are the first steps in riding training. When this much accepted, the camel can then be stood up under rider with the head being held by another person. Camels can buck but not as effectively as horses. For the first few rides the young camel is best led from a trained camel. Reins may be fitted from the first ride but no attempt is made to use them until the camel is well settled and accepts the rider. Once it is assured, the training rider will commence to gradually take more control of the camel and the leading rider gradually transfers more to him. Reins, one or two, may be attached to the halter or even tied around lower jaw behind the canine teeth. Nose lines attached to a nose peg, are necessary to restrain for forward movement of many camels. Camels often do not rein control as effectively as horses, probably because of their peculiar morphology. They can be trained to some degree of response to the rider's legs and feet, aided by threats and taps of the rider's cane. The discipline and response of the camel, just as with the horse, will ultimately depend upon the skill, tact and patience of not only the initial trainer, but more so of those who use it after initial training.

Administering drugs to camels

Oral application of drugs is done by drenching, through bolus or medicated feed. Drenching and bolus administration are best accomplished with the animals seated, the head is then immobilised and tilted slightly backwards and the liquid medication poured onto the back of the tongue. Boluses (boli) and tablets should also be placed on the tongue as far back as possible. Medication of feeds is rarely done since most camels have to find their feed on pastures. One exception is the dosing of granulated mineral mixtures with anthelmintics, which has become a proven practice.

Vaccines are available against haemorrhagic septicaemia, haemorrhagic enteritis, blackquarter, pox, anthrax, rabies etc. All animals must be protected against these diseases. The same hygienic

care and sterilization procedures have to be observed in injecting drugs to camels as in all other livestock.

1. Condition scoring

The condition of camel is estimated by looking at the store of body fat (i.e...the hump). This reflects the internal fat reserves and provides a good correlation with total body fat. The camel deposits excess energy as fat into the hump sac and into some internal linings.

2. Ear tagging

Using a string or metallic tags with numbers on them may be attached to the ear of the animal.

Training of herd using halters

- Calves are accustomed to handling from the earlier age.
- At 2 years old they are introduced to the discipline of control by head rope or by a nose-peg made of wood, bone or very occasionally metal. This is passed through the nose below and towards the extremity of the nasal bones.
- At first calves merely carry the attachments, but later they are incurably handled and trained.
- On the other hand tying the upper lip with rope and drag towards the ground till it accepts all the orders and becomes perfect.

3. Weighing camels

Two methods are applied to obtain the body weights:

- Using a weighing bridge of 1000 kg capacity where this technique was used in the morning before feed is offered to the animals.
- Using equation as described by Kohler-Rollefson *et al.* (2001):

Live body weight (kg) = shoulder height X chest girth X hump girth X 50kgs.

4.2.2. Taking care pregnant camel and assisting parturition.

Avoid stressing pregnant animals and do not bleed them to obtain food for people (as is done in some pastoral societies). Treat the umbilical cord with iodine/pyodine or another disinfectant. In traditionally managed herds in Kenya, camels first calved at an average age of 4 years and 10 months. In one of the studies in Niger, it was found that between 3 and 80% of

females first gave birth at 4 to 5 years. About 95% had produced at least one young at 6 years, whereas one of these groups of camels did not produce their first young till 8 to 9 years age. A survey carried out among herders in Sudan indicated that 2% of females first had a calf at 3 to 4 years age, 10% at 5.5 years, 37% at 5 to 6 years and 51% at more than 6 years. At the National Camel Research Centre in India, age at first calving was reduced from 5 years 2 months in the period 1961-85 to 4 years and 1 month from 1986-90, Mainly due to the effects of better management. In the United Arab Emirates animals whose own birth dates were known were mated first at 3 years and 7 months and calved at 4 years and 7 months.

In summary, it seems that the management implications of this are clear: better feeding, improved health care and better overall management will enable camels to produce their first calf at a younger age and add to the total length of their breeding life. In traditional systems better feeding conditions may result from long-distance migration. In sedentary or modern systems, supplementary feeding in early life and keeping camel numbers down to the carrying capacity of the feed resource will help to lower the age at first calving. Further information on feeding to improve overall performance is given in chapter on

i. Taking care for new born calves

During calving all the mucous and watery discharges should be clean from the new born. Then after help to get in to its feet and allow suckling colostrums for a short period of time.

After weaning temporary identification, plastic tags of different colors may be hung around the neck of the animal using a string or metallic tags with numbers on them may be attached to the ear of the animal and permanent marking by tattooing and branding can be done.

ii. Weaning of calves

Camel calves are usually weaned at the age of 6 to 12 months. When milk is in abundant supply or demand is low, the herders do not interfere and calves suckle milk until their mothers dry up, which might be as long as 18 to 20 months. Such a long weaning period is not commensurate with modern husbandry practices.

Prolonged weaning no doubt delays next breeding. Thus it seems more desirable to wean the calves at the age of 6 months. Normally there is still competition for the milk between the calf and herder and weaning is done when the calves intake of forage is sufficient to sustain. The easiest way of weaning is to transfer the calf to a different herd. Since this is not always possible, therefore, other weaning techniques were developed.

- a. **Thorn Method:** Large and sharp thorns are pushed through the upper lips of the calf from the inner side and fixed in place with acacia resin. If the calf now tries to suckle, it will prick the dam's udder and thus will be kicked away. The thorns can be removed after about 10 days.
- b. **Tying Upper Lip:** Tying the prehensile parts of the split upper lip with a thin string in a figure of eight knot, making it impossible for the calf to keep a hold on the teat. With these techniques weaning can be achieved within a few days. There are other methods such as to partially cut a small skin flap from the nose of the calf and tie this in an upright position with bark fibres, the other is to separate a thin strip of the dorsal mucosa from the tongue muscle. These methods make suckling painful for the calf. These methods are more painful as well as involve an element of cruelty and, therefore, better not be practiced.

Health management program of a camel

How to examine a Camel

It can be difficult to determine what diseases a sick camel has. You need examine it carefully, checking for typical signs of disease, as well as other, less usual signs.

A. Physical examination

Examine the camel first from a distance to observe its behavior and general appearance. Then do a close- up examination from head to toe and check out individual organs. Pay attention to the following (again write down notes if possible).

Behavior and Appearance

- Unusual behaviour (e.g. lying down at odd times, lack of appetite eating strange things, weakness, dullness, tiredness lameness, scratching)
- Difficulty in breathing
- Coughing. To get the camel to cough so you can listen to it, offer it some water or feed on the ground so that it lowers its head.
- Difficulty in walking, unusual posture
- Swelling joints
- The animal's appetite, feeding and ruminating. Lack of appetite is most apparent while the animal is out at pasture. Sick camels may still eat fodder that is placed in front of them, but lack the energy for grazing
- The temperature of different parts of the body
- The breathing rate
- The animal's heartbeat
- The hump

i. Skin

- Unusual appearance of the skin and hair
- Presence of parasites on the skin
- Elasticity of the skin: pull the skin fold up and check how long it takes until the skin becomes flat again; the less elastic the longer it takes.
- Presence of oedema (swelling)

ii. Mouth, nose and ears

- Colour of the mucus membrane inside the mouth and nose. This should be pink. If the camel has fever, the colour becomes redder and dark if it is pale or whiter, this is the sign of anaemia.
- Discharge from: one nostril (sinus infection) or both respiratory infections? Discharge watery, bloody, or thick, and yellowish?
- Discharge from one or both ears
- Smell from the mouth of the camel

iii. Eyes

- Tears or other discharges from the eyes
- Colour of the skin under the eyelids: one eye only(local inflammation) or both eyes more general disorder
- Swelling of the eyelids

iv. Faeces and Urine

- Colour and smell of the urine both fresh and encrusted on the hairs of the tail)
- Colour, consistency and odour of dung or diarrhoea. Normal dung is hard, round, oval and green. Camels fed with dry feed produce black pellets.
- Appearance of worms in the faeces
- Colour of the skin inside the anus
- Discharge from the vagina: Blood may be a sign of abortion. After calving, the normal discharge s red or brownish for several days.

v. Milk

Color, odor and consistency of milk

Taking the body temperature

Tie one end of the string to the thermometer and the other end to a clothes-peg. Shake the thermometer to bring the mercury level below the normal temperature of the animal. If necessary, grease the thermometer with Vaseline or oil to make insertion easier.

- It is best, although essential, to take the temperature when the animal is sitting and is restrained securely by its handler. Hold the tail firmly or tie it to the side and insert the bulb of the thermometer 3-5cm into the rectum. Clip the clothes-peg to the hair at the base of the animal's tal to prevent the thermometer from getting lost.
- Leave the thermometer in position for about 3 minutes
- Take the thermometer out and read the temperature
- Shake the thermometer again to bring the mercury back into the bulb, then clean it and put it back into its case.

vi. Taking heart rate (Pulse)

You can feel a camel's pulse with your fingers:

- On the underside of the tail , near the root(only in young animals)
- Inside the hind legs, about 18cm above the point of the hock(although this location may be dirty and crusted with urine)
- Behind the knee in the front leg

You can also listen to the heart rate with a stethoscope in the armpit (in the angle behind the front leg)

A healthy camel heart beats 30-50 times a minute. If the camel has a fever, the pulse becomes hard, fast and wiry.

4.2.3. diagnosing and treating diseases

Examine the sick animal and its surroundings carefully, question the owner. First look at the general signs (fever, weakness, lack of appetite, diarrhea etc.) Then try to narrow down the range of possible disease by checking for signs that are more specific to particular disease (e.g. blood in the faeces, pimples on the lips, abortion etc.). Double check for signs of the disease you suspect. Check also for the signs that are not present: for example, many diseases cause diarrhoea, but diarrhoea without fever may well be worm infestation.

- **Difficulties in diagnosing**

- ✓ It can be difficult to decide what disease the sick camel has.
- ✓ The animal may show only some of the signs of the disease (in fact it is rare to see all of the characteristic signs at the same time).
- ✓ The same disease may produce different signs in different animals.
- ✓ Different diseases may produce the same sign. A camel may be suffering from more than one disease and the signs may mask or reinforce each other
- ✓ Because they are generally placid animals, camels often do not show much distress , even if seriously ill. This complicates diagnosis, especially if the camel suffers from a general, systemic illness that affects its whole body and not a particular organ.

Common Disease Signs

- The following signs can be caused by many different types of diseases:

- ✓ Fever
- ✓ Weakness
- ✓ Dullness
- ✓ Tiredness
- ✓ Lack of appetite
- ✓ Lying down at unusual times
- ✓ Rapid heart beat

If you see these signs, check for other more specific signs that will help you determine the disease and correct treatment. Arriving at the correct diagnosis is often a matter of experience. Often a major sign is accompanied by several others: taken together, they give you an idea about which disease you are facing and so how to treat it.

Signs of dehydration (lack of water)

Pinch a fold of skin and let it go : it returns only slowly to its normal position

- Signs of anemia
 - ✓ Skin inside mouth and nose is pale or whitish
 - ✓ The conjunctiva are pale
- Signs of Pain
 - ✓ Neck erect and stiff, sometimes quickly lowering and raising the neck
 - ✓ Watery eyes
 - ✓ Sitting uneasily , shifting body around
 - ✓ Grunting when breathing or ruminating
- Normal in Camels
 - ✓ Shrunk hump(in female suckling a calf)
 - ✓ Grinding of teeth, foam in mouth: normal after eating salt and in male animals during rutting

4.2.4. Administering Medicine

How to give a medicine depends on the nature of the illness and type of medicine. The main methods are injection, in the mouth, and on the skin. Other methods include in the nose, eyes, ears, vagina, anus, or udder.

Injection

Injecting is a quick and convenient way of giving medicines. It is used for antibiotics and vaccines, as well as for other types of medicines (such as ivermectin against mange). It is sometimes called "parenteral administration."

Ways of injecting

Medicines can be injected into the muscles, under the skin, or into the vein(using a syringe or drips). Check the medicine label to find out which way you should inject the medicine.

Table:4.1.site and way of medicine injection

Where injected	Also Called	Features
Into the muscle	Intramuscular, IM, i.m.	Easy to do, Most drugs are injected this way, Medicine is taken up by the body quickly
Under the skin	Subcutaneous, SC,	Less painful, Used for only some medicines, Medicine is taken up by the body slowly
Into the vein	Intravenous, IV	To give large amount of medicines, Medicine gets into the blood stream immediately, Requires extra care
Into the vein through drip	Drip, Intravenous, IV, i/v	To give large amount of fluid to a dehydrated animal

Syringes

You can use reusable or disposable syringes and needles. Each has advantages and disadvantages. Syringes come in several sizes. For most purposes, you can use a 20ml syringe. Smaller syringes (5ml and 10ml) may be useful to inject small amounts of drugs.

Needles come in different lengths and widths (gauges, measured in G numbers). A needle with low G number is broad, while a high G number is narrow. For most camel works, 16G and 18G needles should be adequate. Use a needle of 2.5cm for injecting into the muscle, and 3.7cm long for injecting into the vein. The needle should be sharp and not bent. Make sure that it fits the type of syringe you have.

Make sure that the syringe and needles are always sterile to avoid spreading diseases from one animal to the other. Hold the needle by its base, and do not touch the point or shaft of the needle with your hand or anything else.

Filling the syringe with ready prepared Medicine

Some medicines come ready to inject. Others must be mixed before they are injected. Follow these instructions for medicines that are ready to inject.

- 1- Put the needle on the syringe and draw back the plunger to fill the syringe barrel with air.
- 2- Push the needle into the rubber stopper of the bottle containing the medicine
- 3- Hold the needle upside down
- 4- Press the plunger to push some air from the syringe into the stoppered bottle
- 5- Pull the plunger to suck in some liquid
- 6- Continue pumping like this until you have enough medicine in the syringe
- 7- Pull the needle out of the stopper rubber and hold the syringe up-side down. Push the plunger to remove the air (until liquid comes out of the needle) you are ready now to inject the medicine.

Filling the syringe with medicine that must be mixed

Some medicines must be mixed with distilled water or special solvent before they are injected. These medicines come in two separate bottles: one containing the medicine(usually powder) the other containing the solvent/distilled water.

- 1- Attach the needle to syringe
- 2- Push the needle through the rubber stopper into the bottle containing the solvent.
- 3- Hold the bottle up-side down and fill the syringe with the right amount of solvent
- 4- Shake the bottle containing the medicine powder
- 5- Inject the solvent into the medicine bottle
- 6- Shake the medicine bottle to dissolve all the medicine powder
- 7- Fill the syringe with the dissolved medicine
- 8- Pull the needle out of the stopper and hold the syringe up-side-down. Push the plunger to remove all the air (until liquid comes out of the needle). You are now ready to inject the medicine.

Prepare the injection site

Before injecting, make sure that the injection site is clean. You may need to clip the hair and use a piece of cotton wool dipped in alcohol or another antiseptic.

Injecting into the Muscle

This is the commonest and easiest method of injecting. You should not inject more than 15-20ml in one place; if you have more medicine than this, inject into two separate places. The most usual injection sites are in the muscles of the neck and at the top of the back legs.

- Restrain the camel
- Fill the syringe with the right amount of medicine
- Prepare the site for injection
- Take the needle off the syringe, and hold it between your first finger and your thumb, with your hand clenched
- Hit the injection site two of three times with the side of your fist

- On the next strike, turn your fist to plunge the point of the needle through the skin and firmly and deeply into the muscle (be careful not to hit bone).
- Attach the syringe with the needle
- Draw back the plunger a little. If blood appears in the syringe, you have hit a blood vessel. In such cases, take the needle out and put it at a different place.
- If no blood appears, press the plunger gently but firmly to inject all the medicine into the muscle.
- Take the syringe and needle out and rub the skin to minimize the swelling.

a. Injecting under the skin

The best places to inject under the skin are just in front of the shoulder, or behind the shoulder, as the camel's skin is loose here. Do not inject more than 50-100ml in one place ; if you have more medicine than this, inject it in two separate places.

- 1- Restrain the animal
- 2- Fill the syringe with right amount of medicine
- 3- Prepare the site for injection
- 4- Pick up a fold of the skin between your finger and thumb
- 5- Push the needle(with no syringe attached) firmly through the skin at the base of the fold.
Make sure that the needle has not come out the other side of the skin fold. The needle should move fairly easily from side to side under the skin.
- 6- Attach the syringe to the needle
- 7- Inject the medicine
- 8- Take the needle out and rub the skin to prevent leakage and help the medicine absorbed

b. Injecting into the vein

Intravenous injections are given only for certain types of medicines and if a quick reaction is needed (for example, in an emergency). Give the injection into the jugular vein (the large vein in the neck).

Some intravenous drugs can be very irritating, and can damage the tissue, if they are wrongly injected outside the vein. It is important to make sure that most of the needle, and not just its tip, is inside the vein.

- 1- Restrain the camel
- 2- Fill the syringe with the right amount of medicine
- 3- Prepare the site for injection
- 4- Apply pressure on the vein to make it swell so you can find it easily. You can do this by pressing your hand on the vein below where you will inject, or by tying a rope fairly tightly around the base of the neck.
- 5- Push the needle (with no syringe attached) slant-wise into the vein, with the point of the needle towards the head of the animal (not its body). If you have hit the vein, some blood comes out of the needle. If there is no blood, pull the needle out and try again.
- 6- Attach the syringe to the needle
- 7- Take the pressure off the vein (by removing your hand or untying the rope) to allow the blood to flow
- 8- Slowly inject the medicine
- 9- Take the needle out and press on the skin with your finger until any bleeding stops.

c. In the mouth

Some medicines are meant for the sick animal to swallow. They are sometimes called "oral medication". In the mouth is sometimes written as 'per os' or 'p.o.' You can make the animal swallow the medicine by

- Forcing the animal to drink(drenching)
- Force feeding
- Mixing the medicine with feed or water
- Through stomach tube

Forcing the animal to drink (Drenching)

To drench a camel, you need a long headed bottle(preferably made of plastic in the case bites it and breaks it), a drenching gun, a cp or a jar. if you use a glass bottle, you can attach a piece of plastic or rubber tube to the neck so only the tube enters the camel's mouth.

- 1- If the medicine is a powder, mix it with a little water
- 2- Put the medicine into the bottle
- 3- Tie the camel's forelegs firmly together and make the camel to sit down
- 4- Ask the handler to grasp the upper lip with one hand and the lower lip with the other, and force the animal's head back so the mouth is pointed upwards.
- 5- Push the bottle neck into the side of the camel's mouth where there are no teeth, and pour some medicine onto the back of the tongue. Allow the animal to swallow the medicine before pouring more in.
- 6- If the camel does not swallow , have the handler shake the its head from side to side, or gently massage its throat

Force Feeding

You force-feed medicines that come as pills, pastes, capsules or boluses. You do it in a similar way to drenching. Dipping the medicine in oil or water makes it easier to swallow.

- 1- Tie the animal's forelegs firmly together and the animal sit down
- 2- Force the animal's head back so the mouth is pointed upwards
- 3- Put the medicine at the back of tongue, as far back as possible
- 4- The camel should swallow the medicine immediately. You can drench with 300-500ml water to help it swallow. If it starts coughing, lower its head to prevent it from choking

To administer boluses, capsules, pills, you can use balling gun.

- 1- Tie the animal's forelegs firmly together and make the animal sit down
- 2- Force the animal's head back so the mouth pointed upwards
- 3- Put the tube in the animal's mouth, and hold it tight to prevent the animal from swallowing it

- 4- Put the medicine on the free end of the tube and push it through the tube and into the animal's mouth with the stick

4.2.5. Vaccination programs of animal

General description of vaccine

Veterinary vaccines: they are preparations containing antigenic substances which are administered for the purpose of inducing a specific and active immunity against disease provoked by bacteria, viruses, by parasite or antigenic fraction.

Vaccination: is the introduction of a vaccine into the body to produce immunity to a specific disease. The vaccine may be administered by subcutaneous, intramuscular, by mouth etc...

Types of vaccines

1. Killed vaccine

- Killed vaccine is produced by inactivating the infectious agent (so that it can't replicate in the host) without altering the immunogenicity of the protective protein.
- These vaccines contain adjuvant that enhances the immune reaction.
- Booster doses of the inactivated vaccines are often administered annually.

E.g. black leg vaccine, pasteurellosiss

2. Live vaccines

- These type of vaccines are prepared
 - ✓ Using less virulent strain
 - ✓ Attenuating highly virulent strain. Attenuation is usually made by growing of an infectious organism under abnormal culture condition.

E.g. Rinder pest, Lumpy skin disease,

Route of vaccination

Subcutaneous injection: is particularly convenient in small companion animals where the loose skin at the back of the neck is a commonly used route. **Intramuscular injection:** this route deposits vaccine into location of high vascularity and provides efficient exposure of antigen to the immune system. **Oral route:** this route offers a convenient, powerful route for stimulating local immunity. Mass oral vaccination through drinking water has been used primarily in birds (poultry).

- Intra-dermal injection:

- Intranasal vaccination

Precaution and contraindication of vaccines

- Sick animals shouldn't be vaccinated.
- Animal under immunosuppressive drug treatment should not be vaccinated within three to four weeks.
- Care should be taken in the use of antibiotics when a vaccine containing live bacteria is administered.
- Stressing of animal to be vaccinated should be avoided
- Don't vaccinate through dirty, wet skin
- Repeated uses of needles and syringes with herd is undesirable
- Liquid preparations should always be adequately shaken before use to ensure uniformity of the material to be injected.

Storage and handling of vaccine

Store under the condition recommended by the manufacturer.

- Refrigerated store at 2°C to 8°C is usually necessary
- Quarantine
- Camel disposal
- Preparation of clean paddocks
- Administering of appropriate treatment

Self-Check 4

Written Test

Name: _____

Date: _____

Directions: Answer all the questions listed below

Test 1 multiple choice

1. _____ is root of medicine injection use to give large amount of medicine in to blood stream.

A. intra muscular B. subcutaneous C. intravenous D. drip intravenous

2. One is not sign of diseased camel

A. anemia B. Watery eye C. lack of appetite D. Grinding of teeth

3. Which is not management of new born calves?

A. introduce or supply feed B. temporary identification

C. allow to suckle colostrum D. clean watery discharge

Test 2: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. What is needed in the process of interpreting signs of disease of camel? (3 points)

2. Why diagnosis gets complicated in camel? (2 points)

3. Mention the preferred site/most common site of injection for different types of injection. (3 points)

4. Describe each of the following control measures (4 points)

You can ask you teacher for the copy of the correct answer.

Operation sheet .4

4.1. Restrain camel for inspection, injection, drenching, and milking

1. Tools and equipment

- PPE
- Stick
- Rope/leather rope

2. Procedures

Restrain calves and immature camels

- Hold the upper and lower lips separately in both hands
- Keep them stretched
- Apply stick twitch on one lip

Restrain for brief inspection/examination, drenching or injection

1. Grasp by the tail and the lower neck
2. Hug the camel to ones chest **or**
Grasp the tail and one hind leg just above the hock

Restrain for milking

1. Close one foreleg on itself usually the right one

4.2. Diagnosing health problem in camels

1. Tools and equipment

- PPE
- Record book/prescription paper
- Thermometer
- Stethoscope
- Microscope
- Glove
- Pistel/dishes
- Mouth and face Musk

2. Procedure

- Wear/put on your PPE
- Record the health history under the general information on the record sheet
- Record the main symptoms and appetite
- Write down when last watering is done
- Then take the rectal temperature in the morning and afternoon (morning=36.1°C and afternoon=37.9°C).
- Measure the respiration and pulse rate value (Normal respiration and pulse rate 5-12 per minute and 32-44 beats per minute respectively)
- Observe the Faeces for visible parasites, Consistency and Colour
- Observe the Urine for Colour, quantity
- Observe discharges from vagina, nostrils, mouth and eyes for quantity, consistency and Colour
- Conclude based on your result

4.3. Calculating dosage

1. Tools and equipment

- Gown
- Gloves
- Boots
- Face mark
- Record book/prescription paper
- Thermometer
- Stethoscope
- Microscope
- Glove
- Syringe
- Antibiotic/ medicine
- Heart girth

2. Procedure

- Wear/put on your PPE
- Be sure to follow label direction for the drug used
- Measure the body weight of the camel
- Determine how many mg/units of the antibiotic the measured animal requires

- Calculate how many ml/cc of the drug are needed to provide the required dose

4.4. Administering preventive health treatments

1. Tools and equipment

- Gown Gloves
- Boots Face mark
- Rope/crush Drenching gun
- Balling gun

2. Procedure

- Wear appropriate protective clothes such as, gown; gloves; boots, face mark, etc.
- Restrain animals
- Measure the correct amount of medicine into the drench bottle or balling gun.
- Place hand over animal's mouth and open the mouth by inserting finger in the side of the mouth.
- Open the mouth just enough to allow the neck of bottle or drench gun.
- Do not hold the animal's tongue.
- Place the neck of bottle in the corner of animal's mouth above the tongue.
- The animal will then swallow the medicine.
- Hold the mouth closed for few seconds after dosing to ensure the medicine has been swallowed.

LAP Test/ Job Sheet 4

Practical demonstration

Name: _____

Date: _____

Time started: _____

Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **1 hour**. The project is expected from each student to do it.

Task I: performing diagnosis of health problems in camel

Task II: calculate dosage require

Task III: administer preventive health treatment

Task IV: performing restrain of camel

Request your teacher for evaluation and feedback

LG#16

LO5. Handle and clean material and equipment

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Handling Waste material
- Handling Materials, tools and equipment
- Maintaining Clean and safe work site
- Disposing disposable Materials
- Maintaining, cleaning tools and equipment
- Reporting problems to supervisor.

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to: Handling Waste material

- Handle Materials, tools and equipment
- Maintain Clean and safe work site
- Dispose disposable Materials
- Maintain, cleaning tools and equipment
- Report problems to supervisor

Learning Instructions:

1. Read the specific objectives of this Learning Guide
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

Information sheet -5

5.2. Handling waste material

Runoff from animal production facilities carries manure, soil and other debris that may contaminate surface and groundwater sources. If not managed properly, animal wastes from sources such as hog, beef, dairy, horse, camel, poultry, and sheep operations can affect water quality and, potentially, your health. Bacteria in animal wastes can contaminate drinking water and may cause potentially serious illnesses. High concentrations of nitrate, a form of nitrogen that develops naturally from decomposing organic matter (including manure) and from commercial nitrogen fertilizers in drinking water may particularly harm unborn or young infants and young livestock. The best way to protect water quality for human and livestock health is to manage livestock waste so that it does not contaminate nearby waters.

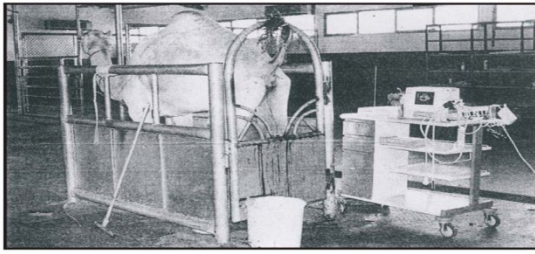
Best management practices are designed to prevent contaminated runoff water from leaving the owner's property and entering surface or groundwater. Along with addressing the potential of animal production facilities to pollute water, sound management practices also improve animal health and make maintenance easier.

Proper manure handling, storage, and disposal ensure that farmers reap the maximum fertilizer value from animal wastes, while reducing risks of groundwater and surface water contamination from improper application of nutrients. Management associated with other aspects of animal production, such as dead animal disposal and feed storage, can also affect water quality. Improper management can introduce bacteria or nitrates to water sources. For this reason, feed storage and animal carcass disposal are included in this self-assessment.

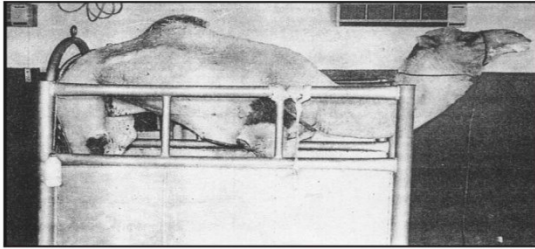
5.2. Handling and transporting materials, tools and equipment

During selecting handling equipments you have to check for their soundness and prepare for use according to manufacturer instruction. Materials and equipment that use for camel handling and husbandry practices are

- Feed resource Detergents
- Weighting scale Coiled meter



Female dromedary placed in stocks for examination per-rectum
Source: Tibary and Anouassi (2000).



Male dromedary restrained in a palpation chute for ultrasonography of testes
Source: Tibary and Anouassi (2000).

Figure 5.1:-Camels in crash

Loading ramps: - Sometimes portable ramps are used and these make a hollow sound under feet that alarms the camels. This can be minimized by a layer of sand 10 to 15 cm deep. The sides of such ramps should be at least 1.8 m high. Any cross bars, such as may be used to prevent spread of the sides, should be a minimum 2.5 metres high above the floor. The width of the ramp and lead up races should not exceed 85 cm to minimize the chance of animals turning around.



Figure 5.2:- Loading ramp

Leg ropes and halters of appropriate size should be selected and used for handling of camel.

5.3. Maintaining clean and safe work site

Personal protective equipment (PPE) for camel handling include

- Boots,
- Overalls and protective eyewear/goggles,
- Rubber gloves,
- Sun protection (i.e sunhats and umbrella) and Sunscreen lotion.

5.4. Returning materials to store and disposing disposable wastes

Camel residues include pallet, spit, toe nail clippings, syringe, disposed medicine, broken glass, plastic bags and liquid waste. Solid wastes should be deposited at an appropriate facility such as pit or bin and burned according to OHS and enterprise environmental practices. Liquid wastes should be disposed following route of drainage canal to enable appropriate disposal

5.5. Cleaning, maintaining and storing tools and equipment

Consumables materials should be discarded according to enterprise policy and procedure. Permanent equipments and materials should be maintained, cleaned, disinfect and stored into appropriate place. Handling area maintenance requirements and equipment faults or malfunctions are detailed and reported according to enterprise requirements

5.6. Reporting work outcomes and problems

In order to make improvements in camel husbandry there is a need of basic data. These includes

- Camel numbers,
- Details of administered preventative health treatments and outcomes,
- Conformation, temperament and performance details,
- Milk yield, bodyweight and condition scoring and
- Observed abnormalities.

Self-Check 5

Written Test

Name: _____ Id _____ Date: _____

Directions: Answer all the questions listed below.

Test I: Multiple choice

- Which equipment is not used to give liquid medicine?
A. syringe B. drenching gun C. Balling gun D. None
- One is handling materials and equipment in camel transportation
A. tattoo pillar B. weighs scale C. Rope D. Feed barrow
- Which are disposable materials in camel farm?
A. nails clipping B. Plastic bag C. Syringe D. Drenching gun

Test II: Write short answer

- List disposable waste in camel farm (3)
- Write handling and transport facilities of camel (3)
- What are important data to be reported in work site? (4)

You can ask you teacher for the copy of the correct answers

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The experts who developed the learning guide

No	Name	Qualification	Educational background	Institution	Phone number	E-mail
1	TerefeTolcha	MSc.	Animal Production	Alage ATVET College	0911067132	terefetc@gmail.com
2	MogesDemilie	MSc.	Animal Production	KombolchaATVET College	0913326341	mogesdemilie@gmail.com
3	MurtessaNegessa	MSc.	Animal breeding and genetics	Mizan ATVET College	0923568489	murtessa12@gmail.com
4	KassahunKebede	MSc.	Animal breeding and genetics	Agarfa ATVET College	0920626996	kassk2006@gmail.com
5	ObsaDiriba	MSc.	Animal Production	Gewane ATVET College	0920022972	obsa9072@gmail.com
6	Areba Hussein	BSc.	Animal Production	Gewane ATVET College	0933161587	arebahussein7@gmail.com
7	BaisaSirna	MSc.	Animal breeding and genetics	Mizan ATVET College	0921917546	baisasirna@gmail.com
8	BekeleAbdisa	MSc.	Animal Production	Agarfa ATVET College	0920839098	bakeabdi@gmail.com
9	Aberashiferaw	MSc.	Animal Production	HoletaPolyTechnique College	0911556155	aberashiferaw@gmail.com