

FEEDING MANAGEMENT GUIDELINES

(Level 3)

Topic	Training & information Content
3.1	Estimating feeding value of fodder & feed on dairy farms
3.2	Sampling feeds & forages/analysis interpretation
3.3	Estimating Dry Matter intake for various breeds/age categories of dairy cattle in the tropics
3.4	Reviewing feed intake, rumen fill, Body Condition Scoring (BCS)
3.5	Life weight estimation of cows
3.6	Rumen fermentation
3.7	Mineral & vitamin requirement, guidelines
3.8	Manure scoring and evaluation
3.9	Guidelines for ration calculations for various breeds, heifers, lactation stage (Rumen8)
3.10	Use of Rumen8 software for ration calculation
3.11	Optimization of ration with Rumen8
3.12	Feeding management guidelines
3.13	Feeding management of dry cows/close up
3.14	Feeding systems
3.15	Metabolic disorders
3.16	Scoring locomotion and hoof condition
3.17	Mycotoxin in dairy cattle nutrition
3.18	Heat stress in dairy cattle nutrition
3.19	Monitoring feeding management, using KPIs (based on Rumen8)



1. You will learn about (learning objectives):

- ❑ Basic feed requirements of a cow and feeding;
 - Feed requirements of a cow.
 - Factors affecting feed requirement in a cow.
 - Guidelines for meeting cow feed requirements.



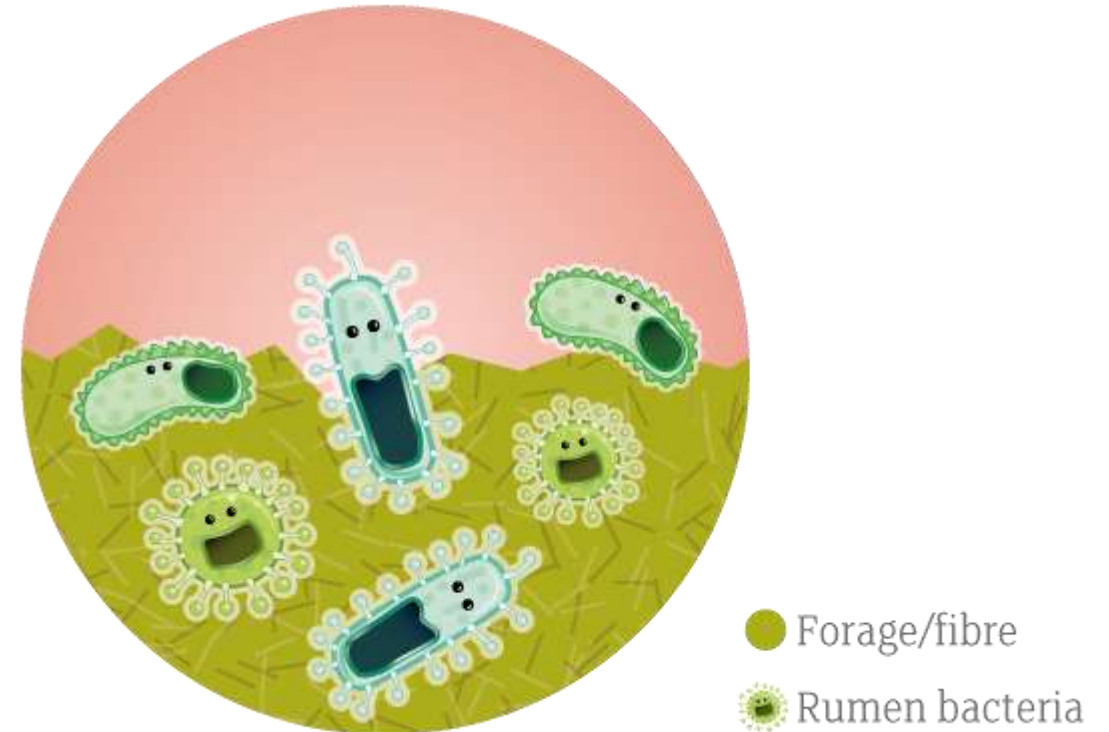
2. Introduction

- Feed costs make up a high percentage of the total cost of milk production in a farm.
- The main objective is to achieve a high dry matter intake (DMI) with feeds of a high nutrient density to produce more milk.
- Rations should meet the nutritional needs of the cows, heifers or calves (a ration is all the feeds the cow eats in a day).
- A well balanced ration helps the cow to maintain good health, fertility and production.
- Weight loss and extreme weight gain to be minimized in dairy cows; they can lead to metabolic disorders.
- Various animal factors influence the nutritional requirements of various categories of dairy cows.



3. Feeding a dairy cow

- Rumination helps to 'crush' feeds into smaller particles, increasing the surface area for the rumen microbes to work on it (degrading).
- The feed particles in the rumen are continuously mixed through muscular contractions that occur at short intervals.
- The feed is regurgitated* and while chewing, the feed is crushed into smaller particles.
- Finely chewed feed sinks to the bottom of the rumen while long fiber feed particles sink lightly into the rumen juices.
- Feeding cows equals feeding rumen microbes that convert feed into usable form for the cow.



*Regurgitate: To bring swallowed feed up in to the mouth again.

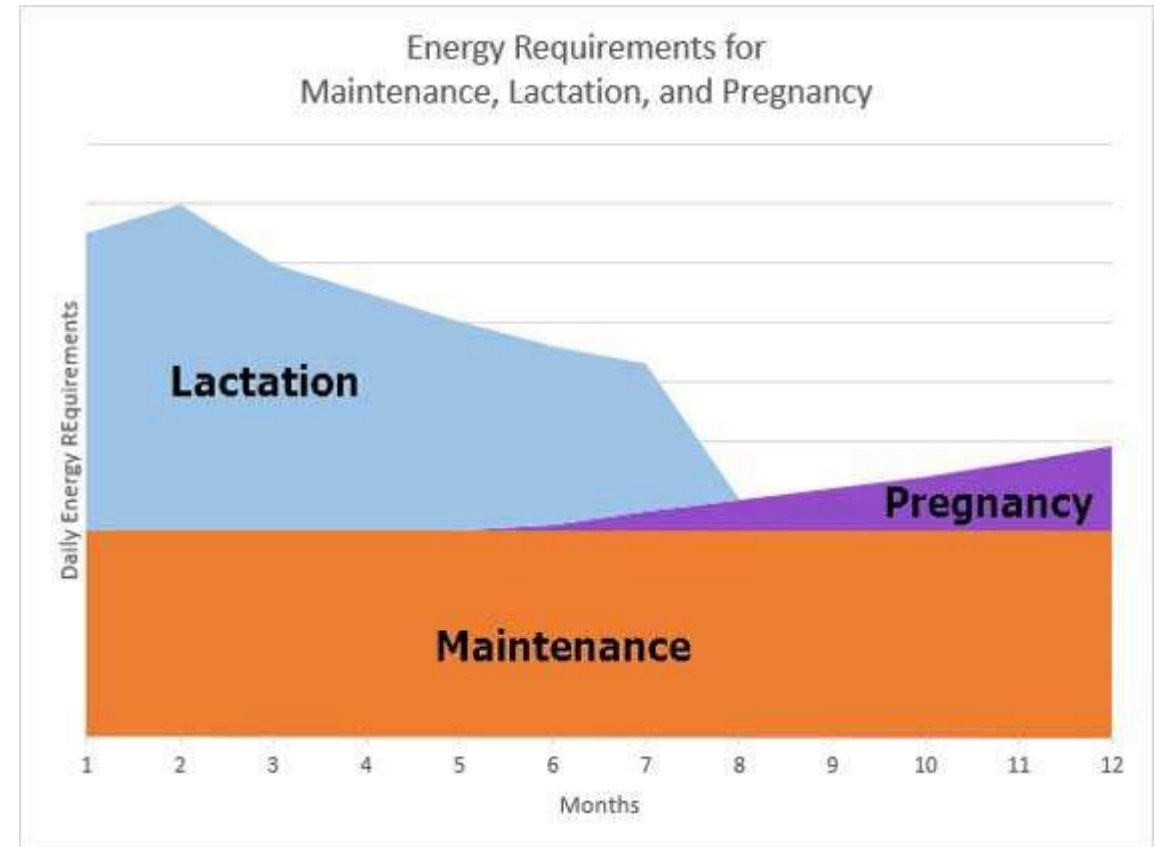
4. Feed requirements in a dairy cow

- i. Water
 - Water makes up a large percentage of cows' body.
 - It is a source of solvent and coolant to the body and makes up about 80% of milk.
- ii. Energy
 - Supports maintenance, growth, production and lactation.
 - Can be sourced from carbohydrates, proteins and fats.
- iii. Protein
 - Is needed for vital body and reproductive functions and is an important structural component of many tissues.
- iv. Minerals and vitamins
 - Support body functions, production and sustaining healthy life of a cow.
- v. Additives
 - Examples include: toxin binders, dewormers.



5. Energy needs in a cow

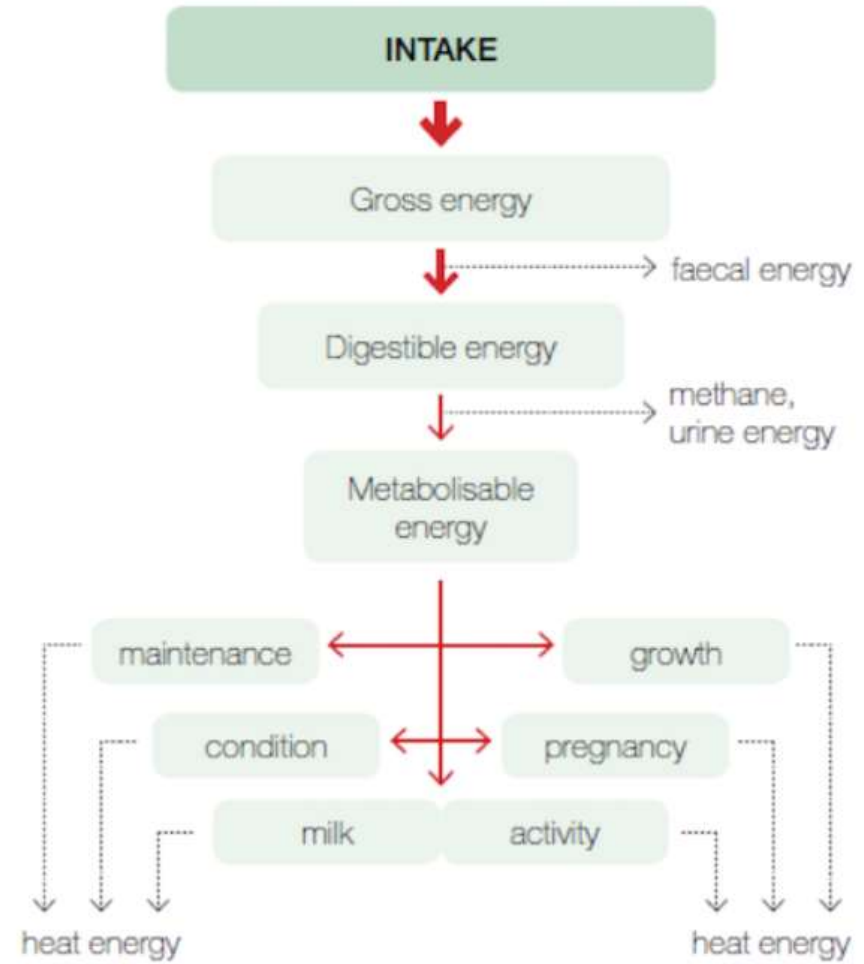
- Energy is stored as a chemical component (sugar, starch, fiber & fat) of feed produced from a metabolic process.
- Not all the energy stored in a feed is accessible in a usable form to a cow, therefore some energy will be lost.
- The energy requirements for maintenance of cows will be met first.
- The additional energy in the ration will then be portioned into other body requirements such as walking, traction(pulling), pregnancy and production.



6. Partitioning of energy feed in ruminants

- Body activities results in energy losses leaving behind a portion of energy for cows' use.
- Initial energy available before metabolism is known as gross energy.
- Energy is lost from cows body through chemical reactions in the body resulting in excretion through feces, urine, gases and heat.
- Final portion of energy is known as net energy; this after heat energy is lost.

The daily metabolisable energy demand by the animal



7. Factors affecting feed intake in cows

- Feeding intake varies from one cow to another depending on various factors such as: animal factors, feed factors, feeding related factors and environmental factors.

i. Animal factors

- Age
- Size/weight
- Stage of production (lactation)
 - Early lactation
 - Mid lactation
 - Late lactation
 - Dry period
- Milk production
- Health
- Cows activity



7.1 Factors affecting feed intake in cows Cont'd...

ii. Feed factors

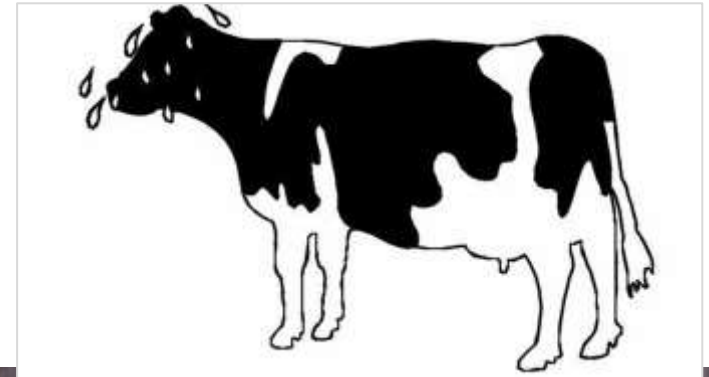
- Feed palatability
- Digestibility
- Moisture content
- Composition of the ration
- Treatment and cleanliness of feed

iii. Feeding related factors

- Regular feeding
- Constant feeding
- Feeding frequency
- Restrict supply of concentrates
- Particle size
- Grazing compared to total mixed rations (TMR)
- Variation of supply.

iv. Environmental factors

- Heat (stress)
- Rain
- Feeding space
- Noise



8. Animal factors: Age

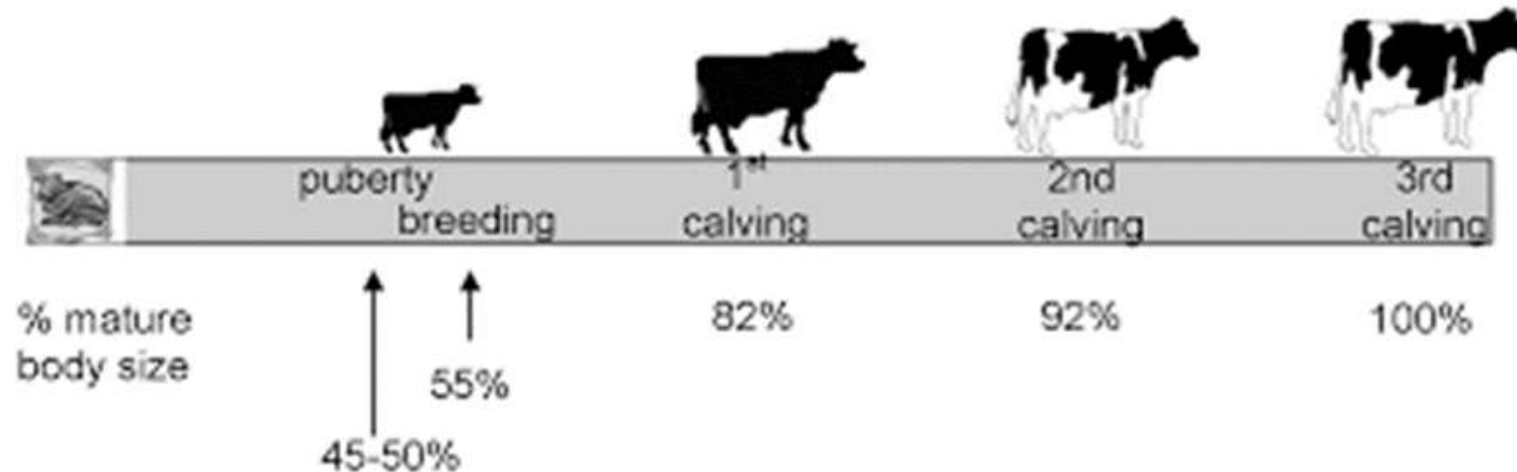
- Cows have limited feed intake, influenced by the rumen size.
- Management of cows at earlier stages (calf rearing) influences rumen development.
- Calves should be gradually introduced to solid feeds such as concentrates and roughage.
- Choose feedstuffs adapted to the cows needs i.e. growing calves and bulling heifers.
- Ability of cows to utilize feeds particularly roughage is influenced by the breed.



8.1 Animal factors Cont'd: Age

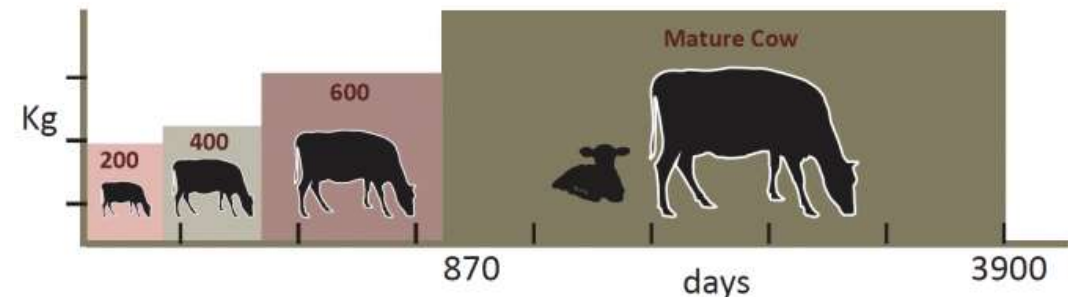
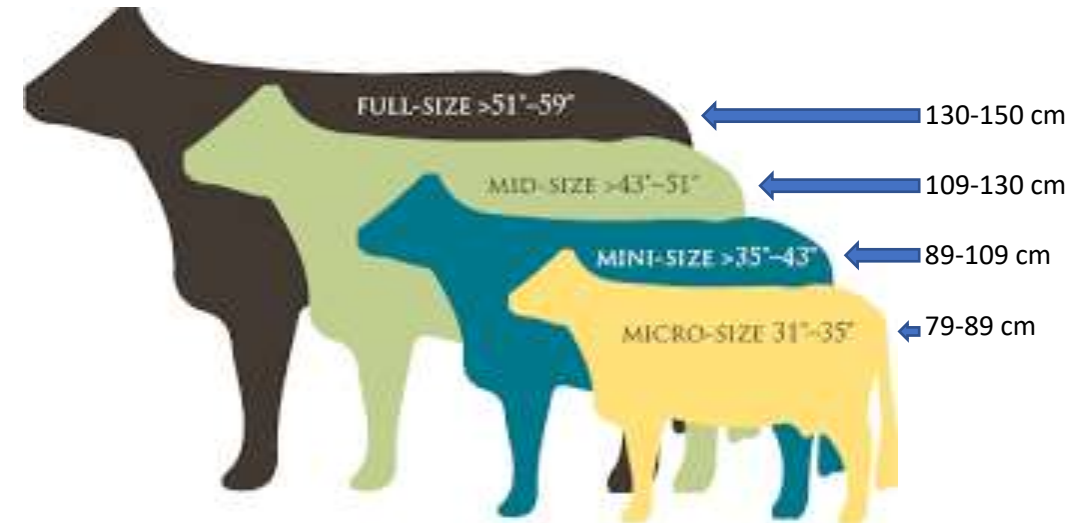
Feeding a first time calver

- A heifer calving down for the first time and cows calving down for their 2nd, 3rd or more time have different feed requirements.
- A heifer calving down for the first time is still growing during its first lactation and going through changes in her body for the first time. Therefore the feed intake needs to cover her nutritional requirements.
- This first time calver needs to be fed for body maintenance, growth, movement and milk production while other second or more calvers are fed for body maintenance, movement and milk production only.



9. Animal factors: Size/weight

- Body size of cows dictate their nutritional requirement. Small bodied cows require less energy and protein compared to larger bodied.
- Size is also influenced by the breed. Holstein Friesian have a bigger body size and weight (weight of 550-600kgs) compared to the Jersey breed (weight of 350-400 kgs) due to their genetic make up.
- For this reason, their feed intake and nutritional requirements are different; Holstein Friesians having a higher feed demand compared to smaller breeds such as Ayrshire or Jersey.



9.1 Animal factors: Size/weight Cont'd...

- Growing heifers need balanced feeding to support growth, ovulation and conception rate; this may necessitate grouping.
- Feeding below their nutritional requirements causes prolonged age of first insemination (above 2 years) leading to loss of a production cycle.
- Body weight influences feed intake. Dairy cows in the tropics generally have a dry matter intake (DMI) of 2.5-3% of their body weight.



10. Animal factors: Stage of production (Lactation) – Early lactation

- Early lactation is between day 1-100 days of lactation.
- During early lactation (approximately 60 days), the cow reaches its peak milk production.
- Feeding at this stage should aim at increasing feed intake as fast as possible.
- This helps maximize milk production and minimize the risk of metabolic disorders.
- Feeds for dairy cows in this stage should have a high energy and protein density compared to dairy cows in other lactation stages.



10.1 Stage of production (Lactation) – Early lactation Cont'd...

- This can be achieved by increasing the concentrate/forage ratio in the ration to offer more energy for milk production.
- Note that concentrates need to be gradually introduced and increased.
- To meet the energy requirement for milk production after calving down, cows need a good amount of highly digestible carbohydrates from concentrates. At the same time the cow converts fat deposits to fatty acids (lipolysis) to provide energy for milk production but this needs to be kept at a minimum.



10.2 Stage of production (Lactation) – Mid and Late lactation

Mid lactation

- Mid lactation stage is between 101-200 days after calving.
- Between 10-14 weeks, feed intake increases to a peak.
- The cows feed intake is now in balance with her needs.
- Increased feed intake generally equals increased dry matter intake (DMI).
- Cow starts to recover her body reserves used during early lactation period.

Late lactation

- Late lactation period is between 201-300 after calving.
- Cows gain weight and increase in body condition.
- This occurs because energy supplied is more than energy needed for milk production.

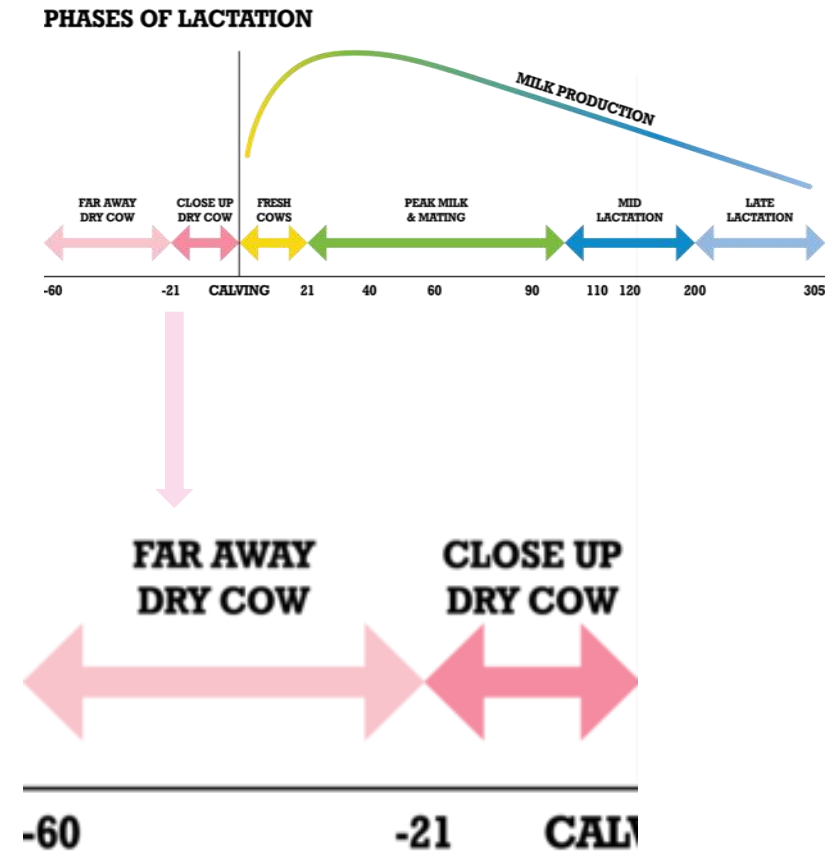
PHASES OF LACTATION



10.3 Stage of production (Lactation) – Dry period

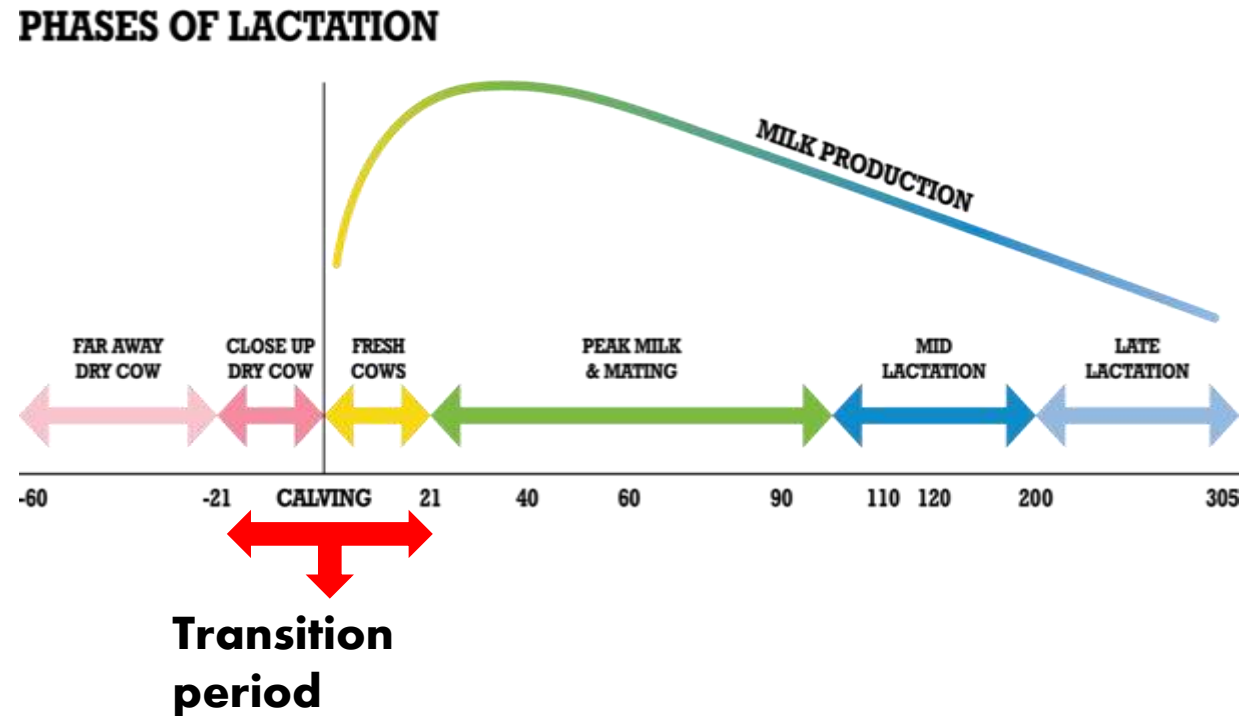
- A dry cow refers to one that is in the dry period of the lactation process. Milk production ceases prior to the dairy cow calving down for the next lactation.
- The cow's dry matter intake during the dry period will gradually reduce to 1.8-2% of the cow's body weight.
- Feeding at this phase is aimed at maintaining body condition. Energy supply of a far-off (60-21 days before calving) dry cow should be higher than that of close-up (21-1 day before calving) dry cow.
- Ensure the diet is balanced. Keep an eye on excess protein (high nitrogen forages), calcium (lucerne) and potassium (molasses) in the dry cows' diet.

Further reference: Module on Feeding management of a dry cow/close up.



10.4 Stage of production (Lactation) – Transition period

- This is the period 3 weeks (21 days) before calving (close-up dry period) and 3 weeks (21 days) after calving.
- Feed intake and feeding management during the transition phase determines milk production in current lactation, reproductive ability and health status of the dairy cow.
- Cows during this phase often have a lower dry matter intake therefore maintaining dry matter intake is important.



11. Animal factors: Animal Health

- Sick cows in most cases have a reduced appetite and thus a lower feed intake.
- Sick cows need to be fed a special ration that is highly palatable and digestible to meet her nutritional requirement and to bring her back into a healthy condition.



12. Animal factors: Milk production

- Group cows according to milk yield because cows at different production levels have different nutritional requirements.
- As dairy cows increase daily milk production, they may need to be supplemented. Note that the dry matter intake (DMI) of dairy cows with high milk production needs to be high to meet their nutritional requirement (this can best be realized by making good quality forage available).



13. Animal factors: Cow activity/movement

- Cows fed in zero-grazing units (confined) have different nutritional requirements compared to grazed cows.
- Energy spent while grazing is lost in the environment.
- Cows that have to track long distances in rough and steep terrain lose more energy. This energy needs to be compensated through supplementary feeding.



14. Feed factors

Feed palatability

- Fresh forages are well accepted by cows.
- Well fermented (preserved) silage is also acceptable.
- Hay of young, leafy vegetative pastures is more palatable than hay of mature grass.

Digestibility

- This refers to the (speed of) movement of feed in the digestive tract.
- Fibrous feeds move more slowly, take more time to digest compared to concentrates.



14.1 Feed factors Cont'd...

Moisture content

- Feeds with low dry matter content have a slower/lower dry matter intake.
- For example, fresh grass has a low dry matter content hence to achieve a high dry matter intake will take more fresh grass.

Composition of the ration

- Is the amount/quantity of dairy meal in the ration in relation to the forage quantity.

Treatment and cleanliness of the feed

- For example contamination with soil or manure.

Further reference: Module on Evaluating forage quality.



15. Feed related factors

Regular feeding

- Refers to fixed feeding intervals (same times of the day).

Constant ration

- Changes in the composition of the feed ingredients in the ration will decrease feed intake for some time.

Feeding frequency

- Smaller portions several times per day versus feeding or giving all the feed at once.

Restrict supply of concentrate

- Do not feed all the concentrates in the ration at once but spread over 3-4 feedings per day.



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15.1 Feed related factors Cont'd...

Particle size

- Size of the ration ingredients influences feed intake by cows.
- Long, stemmy hay slows down and reduces intake and may also necessitate adequate water supply.

Grazing compared to total mixed rations (TMR)

- When cows are grazing, dry matter intake is lower than when cows are fed a TMR.

Variation of supply

- Feed ration of cows need to be consistent.
- Frequent feeding variations does not give cows time to adjust to changes in the ration.



16. Environmental factors

Heat (stress)

- High solar radiation while eating lowers dry matter intake.
- High temperature and humidity lowers dry matter intake.

Rain

- Protect feed against rain.

Feeding space

- Avoid causing stress at feed fence/bunk as it influences voluntary feed intake of cows.
- Enough feeding space gives easy access to the feed by each animal.

Noise

- Keep the feeding area free from noise while cows are eating.



17. Feeding systems

- Feeding systems refer to methods that farmers choose to feed their cows. Common systems include:
 - i. Pasture/grazing systems: Systems where cows majorly rely on grazing their own feed.
 - ii. Semi-confined systems: Cows access pastures in the field for a period of the day and the rest of the time mostly at night are confined.
 - iii. Confined systems (zero-grazing system): Animals are placed in a densely populated, high potential area in one place where feed and water are brought to the animals.

Further reference: [Module on Feeding systems.](#)



18. Balanced feed for a cow

- Cows are ruminants; they can digest forages which are undigestible for monogastric animals.
- Forages provide many nutrients but are generally not balanced. This can be as a result of feeding low quality forages, or those that are either high in energy but low in protein or vice versa.
- To formulate a balanced ration supplementation with extra energy/protein/minerals/vitamins is needed.
- Supplementation can be done with;
 - i. Other forages
 - ii. Concentrates (grains, agro-industrial by products)
- It is advisable to maintain a minimum forage to concentrate ratio of 40:60 percent on weight basis.



18.1 Feeding Forages to cows

- Forages are essential to support rumen activity and can be produced on farm at low costs.
- Forages help prevent rumen acidosis. In case of rumen acidosis feeding dry, fibrous forages can ease the problem.
- When feeding fresh forages it is recommended to cut them at the right and most nutritious stage.
- Feed planning reduces constant ration changes.



18.2 Feeding Concentrates to cows

- Feeding concentrates may vary within the year due to accessibility and cost which can influence changes in the formulation of the ration.
- Farmers in urban settings and/or with small land holdings are prone to using more concentrates in the ration.
- Introducing concentrate needs to be gradual and dozed to avoid acidosis.



19. Feeding guidelines

- Make a feed plan for all animal categories every year.
- Observe animal behavior while feeding.
- Inspect feeding and watering areas for the animals (indoors and outdoors).
- Feed in relation to animal wellbeing and welfare.
- Compare cost of feeds (per kg, per kg DM, per MJ ME, per kg CP).



20. Feed planning

- Do not limit forage production to immediate needs of the cows.
- Long-term access to quality feeds needs to be key for dairy farmers. This will not always be done perfect but can reduce incidences of unavailability of feeds.
- Farmers with small land holdings can consider creating more storage space and buy forages (hay or silage) when supply is high and prices are lowest.
- Forage conservation is a tool in pasture management which farmers can consider and embrace in feed planning.



20.1 Importance of feed planning

- It avoids instances of feed shortages.
- Guarantees consistent milk production and supply to the milk processor.
- Helps avoid extra costs incurred when demand for forages in the market is high (dry season).
- Effective storage needs to be available on farm to avoid or reduce spoilage/wastage.



21. Animal feeding behaviour

- Farmers should check animal behavior especially around the feeding area. Check on;
 - Eating behaviors
 - Drinking behaviors
- The amount of time animal spends eating can signify presence of adequate feed especially for pasture-based systems.
- Cows standing (not eating) while others are eating can sometimes signify poor appetite or bullying by other cows.
- Climate influences animal requirements; during hot weather more feed and water should be offered to cows. Constant visit to watering points and drooling signifies water demand.



Drooling cow

21.1 Inspecting feeding and watering areas

- Feeds and water need to be accessible to all cows at all times.
- Dimensions of feed fence or bunk may not facilitate easy access to the feeds. In such a case adjustments need to be made.
- Cows stepping in the feed bunk or through the feed fence while eating is not a good sign, this contaminates feedstuffs (check feeding structure).
- Water troughs need to be checked regularly and cleaned if required. Water is free of smell, taste and clear.



22. Animal welfare and wellbeing

- Animal welfare refers to how an animal is protected and cared for through the treatment it receives.
- Inadequate feeding undermines animal welfare.
- Feeding is a way through which farmers meet animal needs (welfare) next to the general care and protection they offer.
- Overfeeding and underfeeding affects animal welfare.



23. Feed costs

- Costs apply whether on is feeding home-grown forages or purchasing feeds from the market.
- Accounting for cost of feed ingredients is key.
- Feed costs influence profitability of the farm.
- Feed costs also guide farmers with ration formulation.



24. Understanding feeding results/outputs

- Observing and monitoring animal feeding behaviour is a good way to confirm feeding management issues.
- Leftovers at the feed fence or in the feed bunk give a rough suggestion of the animals response to the feed.
- Observing and monitoring rumen fill gives a good indication of feed intake on a daily basis.
- Void in the rumen suggests that animal has not had enough feed for the day.
- Belly fill gives a good indication if the animal has had enough feed in previous days (over a period of a week).

Further reference: [Module on Review feed intake, rumen fill, BCS.](#)



24.1 Understanding feeding results/outputs Cont'd...

- Observe the general body condition. Feeding affects the cows body condition and gives an indication how well the cows have been fed over the past month.
- Check the manure of the cow, consistency is an indication of the type of feed and nutritional status of ingested feeds.
- Review the milk production of the cow, big differences in milk production per day signifies inconsistency in the feed plan.

Further reference: Module on Review feed intake, rumen fill, BCS.



25. Summary/Take home messages

1. Consistent observation and monitoring of cows helps identify any changes before situation gets out of hand.
2. Make rations according to animal categories (groups), production levels and health status.
3. Introduce new feeds gradually to allow cows (rumen microbes) time to adjust to changes in the ration.
4. Consider feeding methods that encourage a higher feed intake in the subsequent feeding systems.

