UPSC CSE Subjective
For Veterinary Science

ANIMAL NUTRITION

UNIT 6

- **Advances in ruminant nutrition, Nutrient requirements, Balanced rations, Feeding of calves, pregnant, work animals and breeding bulls, Strategies for feeding milch animals during different stages of lactation cycle, Effect of feeding on milk composition.**

UPSC PYQs

1. Discuss the formulation of a balanced diet in lactating dairy cattle, pregnant cattle and heifers? (2012)
2. Explain the guidelines to feed high yielder cows? (2015)
3. Write in brief about the feeding schedule for breeding bulls?(2018)
4. Define a balanced ration. Write desirable characteristics of ration? (2018)
5. Give a brief account of feeding of calves from birth to 3 months of age? (2021)
6. How to calculate the protein requirement of growing calves? (2021)
7. Define balanced ration and describe the ideal characteristics of a balanced ration for breeding bulls? (2022)
8. Describe the nutritional factors affecting the composition of milk in dairy cows? (2023)

Balanced ration

A balanced ration is one that provides all the essential nutrients in the proper amounts and proportions required for the optimum performance and health of an animal. It contains the necessary nutrients like energy, protein, minerals, and vitamins in the correct ratios to nourish the animal properly

Desirable Characteristics of a Balanced Ration

1.Adequate in all nutrients: The ration should supply sufficient amounts of energy, protein, minerals, vitamins, and other essential nutrients to meet the animal's requirements for maintenance, growth, production, and reproduction.
2.Proper nutrient balance: The ratio of nutrients like energy to protein, calcium to phosphorus, etc. should be maintained at the recommended levels for the specific animal species, age, and production stage.
3.Palatable and appetizing: The ration should be palatable and appealing to the animal to encourage maximum voluntary intake.
4.Economical: The ration should be cost-effective and utilize locally available feed resources efficiently.
5.Minimize digestive disturbances: The ration should not cause any digestive disorders or metabolic diseases in the animal.
6.Minimize feed wastage: The ration should be formulated to minimize feed wastage and spillage.
7.Consistent quality: The ration should have consistent nutrient composition and quality to ensure uniform intake and performance.
8.Flexibility: The ration should be flexible enough to accommodate changes in prices and availability while maintaining the necessary nutritional balance.

- **Feeding High-Yielding Cows:**
- Phase Feeding: A strategy involving multiple diets over short periods to match nutrient needs, reducing over- and under-feeding. Proper implementation aligns with animal performance and profitability goals.
- Cost of Feeding: Feed accounts for about 70% of dairy production costs, significantly influencing productivity. Nutritional deficits, especially post-calving, can lead to Negative Energy Balance (NEB), where cows may lose 90-135 kg of body weight.
- **Feeding Phases:**
- Phase 1 (Early Lactation, 0-10 weeks): Focus on peak milk production; increase concentrate gradually post-calving.
- Phase 2 (Mid Lactation, 10-20 weeks): Achieve maximum dry matter intake (DMI) to minimize NEB; maintain a balance of protein sources.
- Phase 3 (Late Lactation, 20-30 weeks): Reduce feed costs; match intake to production levels.
- Phase 4 (Dry Period, 30-60 days): Rest and prepare for the next lactation; optimal dry period is 45-60 days.
- Phase 5 (Transition, 21 days pre- and post-partum): Manage dietary electrolyte balance to prevent hypocalcemia.

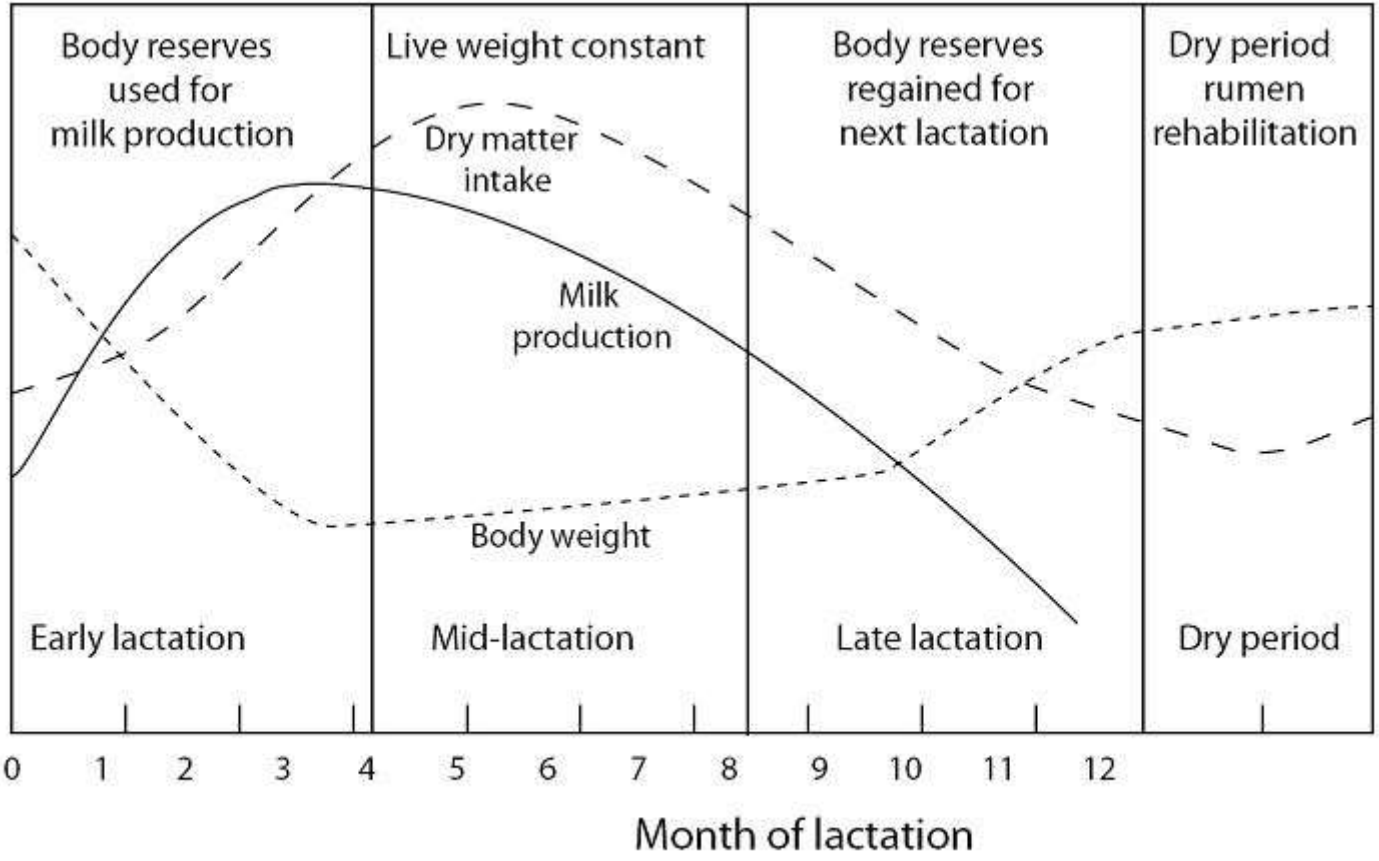

Figure 1. Dry matter intake, milk yield and live weight changes in a cow during her lactation cycle

Feeding breeding bulls

1. Leguminous Green Fodders: Examples: Berseem, lucerne.

Protein Content: 15-25%

Energy Content (TDN): 50-60%

Provide access to these when available.

2. Concentrate Feeds: Use when non-leguminous forages or grazing are the primary roughage sources.

Protein Content: 14-18%

Energy Content (TDN): 70-80%

3. Diet Balance: Adjust the roughage-to-concentrate ratio based on the quality of roughage available and the specific needs of the bull.

4. Minerals and Vitamins : Include essential nutrients such as calcium, phosphorus, selenium, and vitamin E in the diet.

5. Avoid Overfeeding: Excessive body weight can negatively impact libido and mating efficiency.

Feeding breeding bulls

BW (kg)	DCP (g)	TDN (kg)	Ca (g)	P(g)
400	380	3.6	18	13
500	450	4.5	20	15
600	530	5.4	22	17

Nutritional factors affecting the composition of milk in dairy cow

1. **Diet:** The primary nutritional factor influencing milk composition is the cow's diet.

2. **Energy intake:** Adequate energy intake is essential for milk production.

3. **Protein intake:** Protein is crucial for milk production, as it provides the amino acids necessary for synthesizing milk proteins.

4. **Fiber content:** High-fiber diets may lead to lower milk fat content, while low-fiber diets may result in higher fat content.

5. **Mineral and vitamin intake:** Adequate levels of minerals (e.g., calcium, phosphorus, magnesium) and vitamins (e.g., vitamin A, vitamin D) are essential for milk production and overall cow health.

6. **Water intake:** Sufficient water intake is crucial for milk production. Dehydration can lead to reduced milk production and changes in milk composition.

7. **Stage of lactation:** The nutritional requirements of a dairy cow can change during different stages of lactation.

Feeding Strategies by Lactation Stage

- **Early Lactation (0 to 70 Days Postpartum)**
- Needs: High energy and protein due to peak milk production.
- Protein: 16-19%, with 30-35% as ruminally undegraded protein (RUP).
- Feeding Tips: Maximize Dry Matter Intake: Offer high-quality forages and concentrates.
- Challenge Feeding: Use high-energy diets to meet energy needs.
- Gradual Concentrate Introduction: Start with 0.5 to 0.7 kg/day to avoid digestive issues.
- Supplementation: Include high-fat and high-protein oilseeds like soybean.

Mid Lactation (70 to 200 Days Postpartum)

•Goals: Maintain milk production and cow health.
•Feeding Tips: High-Quality Forage: Make up 40-45% of the diet.
•Monitor Body Condition: Adjust feed to maintain optimal body weight.
•Total Mixed Ration (TMR): Use TMR for consistent nutrient supply.

Late Lactation (200 to 305 Days Postpartum)

•Focus: Prepare for the dry period and reduce nutritional needs.
•Feeding Tips: Gradual Energy Reduction: Lower energy density to match declining milk production.
•Maintain Forage Quality: Continue providing good forages for health.
•Transition Planning: Adjust diet to prevent metabolic disorders before the next lactation.

Effect of Feeding on Milk Composition

•Proper nutrition during lactation influences milk yield and composition.
•High-quality diets lead to better milk fat and protein levels, while poor feeding can result in lower milk quality and production.

Feeding of Calves

1. Last Trimester of Pregnancy

•Nutrient Boost for Dam: Provide 15-20 kg of green fodder daily to enrich colostrum with vitamins A, D, and E.

2. Pre-Ruminant Period (0-3 Months)

•Key Feeding Steps: Colostrum: Essential for passive immunity; feed within the first 3 days.
•Whole Milk: Gradually introduce from 4 days to 2 months, adjusting quantity based on body weight.
•Calf Starter: Introduce around 3 weeks; should contain 23-26% protein and 75% TDN for rumen development.
•Milk Replacer: Use to reduce costs while maintaining growth.
•Feeding Schedule:1-3 days: Colostrum (1/10th BW in 3 feeds)
•4-7 days: Whole milk (1/10th BW in 3 feeds)
•8-14 days: Whole milk (1/10th BW)
•15-21 days: Whole milk (1/10th BW), introduce a little calf starter and hay.
•22-35 days: Whole milk (1/15th BW), 100 g calf starter, hay ad lib.
•Up to 2 months: Whole milk (1/20th BW), 250 g calf starter, hay ad lib.
•2-3 months: Gradually reduce milk, increase calf starter to 500 g, hay ad lib.

3. Feeding from 3 to 6 Months

•Green Forage: Start with 2 kg/day, increasing to 5-6 kg by 6 months.
•Concentrates: Feed 0.75 kg in the 4th month, 1 kg in the 5th, and 1.5 kg in the 6th month.
•Hay: Feed ad libitum.