Feeding management of dairy cows

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Feeding Management of Dairy Cattle

OBJECTIVE

- To impart the knowledge on practical approach of feeding dairy cattle for milk production

INTRODUCTION

- Nutrient requirements of dairy cattle should be calculated
- Nutritive value of feedstuffs should be assessed
- Ration formulation and feeding of dairy cattle
- Ration should include adequate energy, protein, minerals and vitamins
- Ration should be given as concentrate and roughage
- Concentrate feed will be prepared by mixing locally available feed ingredients
- Roughage should be given as green and dry roughage
- Economics will also be assessed

Importance of Nutrient Requirements

- **Sustain the life process**
  - Maintenance – normal activities
- **Production**
  - Pregnancy
  - Lactation

Maintenance requirements of lactating cattle and buffalo per day

Body weight (kg)	DM (kg)	TDN (kg)	ME (Mcal)	MP (g)	RDP (g)	CP (g)
200	4.32	1.92	6.94	141	220	259
250	5.4	2.28	8.24	167	260	306
300	**6.48**	**2.62**	**9.47**	**191**	**298**	**351**
350	7.56	2.95	10.67	214	335	394
400	**8.64**	**3.27**	**11.82**	**237**	**370**	**436**
450	9.72	3.58	12.94	259	405	476
500	10.8	3.88	14.04	280	438	515
550	11.88	4.18	15.10	301	470	553
600	12.96	4.47	16.15	321	502	591
650	14.04	4.75	17.18	341	533	627
700	15.12	5.03	18.19	361	563	663
750	16.2	5.31	19.19	380	593	698
800	17.28	5.58	20.17	399	623	733

DM = Dry mater
TDN =Total digestible nutrients
ME = Metabolishable energy
MP = Metabolishable protein (MP),
RDP = Rumen degradable protein
CP = Crude protein

(ICAR 2013)

DM, energy and protein requirements for milk production/ kg milk in cattle

Fat (%)	DM (kg)	TDN (kg)	ME (Mcal)	MP (g)	RDP (g)	RUP (g)	CP (g)
3	0.450	0.290	1.05	51	44	44	96
4	0.510	0.330	1.20	51	50	37	96
5	0.570	0.370	1.34	51	56	30	96
6	0.640	0.410	1.50	51	62	23	96
7	0.700	0.460	1.64	51	69	15	96

(ICAR 2013)

Pregnancy requirements of energy and protein for cattle**

Month of gestation	DM* (kg)	TDN (kg)	ME (Mcal)	MP (g)	RDP (g)	RUP (g)	CP (g)
6-7	0.85	0.64	2.30	109	96	56	169
7-8	0.99	0.74	2.67	143	112	85	216
8-9	1.13	0.84	3.05	178	128	113	263

*concentrate having 75 % TDN or 2.71 Mcal/Kg DM
**Average birth weight of 25 kg

(ICAR 2013)

Importance of Nutrients

- Water - Helps in digestion and excretion
- Carbohydrate - Provide energy
- Protein - Building blocks of muscles
- Fat - 2.25 times more energy
- Minerals - Metabolic functions of nutrients
- Vitamins - Metabolic functions of nutrients

Feedstuff

CONCENTRATES (<18 % crude fibre)

- ENERGY CONCENTRATES
  - Cereal grains and its byproducts
- PROTEIN CONCENTRATES
  - Oil cakes

ROUGHAGES (>18 % crude fibre)

GREEN ROUGHAGES

- Grasses
- Cereal grasses
- Legume fodders
- Tree fodders

DRY ROUGHAGES

- Paddy straw
- Maize stovers
- Groundnut haulms

Energy Concentrates

CEREAL GRAINS

Cereals

- Maize
- Wheat
- Rice
- Oats
- Barley

Millets

- Sorghum/jowar
- Bajra / cumbu
- Ragi

NUTRIENT COMPOSITION

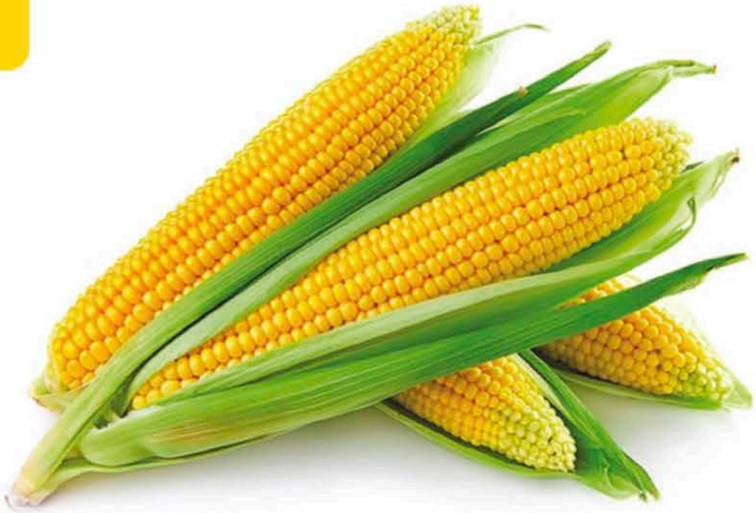
Crude protein	: 8-12 %
Fat	: 2-5 %
Calcium	: 0.15 %
Phosphorus	: 0.3 - 0.5 %

Crude fibre: highest in oats & rice,
lowest in wheat & maize

Deficient in lysine, methionine, Vitamin D

Maize or Corn

- High energy source
- Low in Protein and fibre
- CP: 8-12 % ; TDN: 85-88 % ;
- Low in lysine, Methionine.
- Newer variety



Opaque - 2 ↑ lysine content

Floury - 2 ↑ methionine & lysine

Barley

CP: 6 - 14 %, low in lysine

- **Variety:**

Notch I and Notch II - rich in lysine

Oats

CP : 6 - 15%

High CF: - 10-18%

(deficient in methionine, histidine, tryptophan)

Wheat

CP: 6-12 %;

- Protein

Prolamin & Glutelin

Strong Glutens - bread making

Millets

- **Sorghum: CP - 8-10 %**

  Higher protein & low in oil than maize

- **Bajra: CP - 8-12 %**

  Rich in tannin

  Fiber content more in Sorghum and Bajra.

Milling by-products

- **Bran** - Outer course coat of grain

  Rice bran and Wheat bran -

  - Protein: 12-14%, oil 11-18%
  - More fibre-low digestibility laxative

  Flour - Soft, finely ground meal

  - Protein - 16%, CF - 1-1.5%

Molasses

- By-product from sugar cane industry
- High energy source
- Increases palatability
- Pellet binder
- Reduces dust
- Stimulates rumen activity
- DM :74 %
- CP : 6.5 %
- Ruminant ration: 10-15%

Protein Concentrates

- Soy bean oil cake
- Groundnut oil cake
- Cotton seed meal
- Rapeseed meal
- Linseed meal
- Sesame oil cake
- Copra meal
- Sunflower meal

Soybean meal

- Widely Used
- Must be Heat treated
- Standard for Comparison of Other Protein Sources
- Very palatable and digestible
- 47 % CP
- soybean meal plus 5% soy hulls
- used for ruminants
- Rich in lysine

Ground nut oil cake

- Most widely used high protein feed
- Has about 45% protein
- Deficient in lysine, methionine and cystine
- Liable to contain a toxic factor – Aflatoxin a metabolite of fungus Aspergillus flavus

Cotton seed meal

- **Whole Cottonseed:**

  24% CP, 24% EE,

  20% CF, 98% TDN

- **Contain gossypol: Yellow pigment that is toxic to all livestock, especially non-ruminants**

Rapeseed meal (Canola meal)

- **CP – 35%**

  Used in cattle feed

  ANF removed by heat treatment

Linseed meal (Flax seed)

- Contains residual oil
- Popular among horse owners and show animal feeders because of hair coat

Sesame oil cake

- Contains about 40% protein rich in leucine, arginine and methionine and low in lysine.

Copra meal

- Crude protein low (20-26%) and poor in lysine and histidine.

- The oil content of coconut meal varies from 2.5 to 6.5%

Sun flower meal

- Protein varies with Process Used
  28, 32, 40 or 48% Meals

- In ruminants can be used as Sole
  Protein Supplement

Nutrient Composition of Feed Ingredients (ON DMB)

S. No.	Cereal grains	CP %	EE %	CF %	NFE %	TA %	NDF %	ADF %	Lignin %	ME Mcal/Kg
	Energy concentrates and its byproducts									
1	Maize	9	4.2	2	81.6	2	15.6	3.5	1	3.1
2	Sorghum	8.7	2.5	3	81.6	2.8	10.9	5.9	1.1	3
3	Wheat	11	2.6	2	81.5	2.4	16	4	1.2	2.9
4	Barley	12	2.5	5.9	79	2.5	20	7	2	2.8
5	Oats	11	4.4	15.5	63.3	5	13.8	5	2.9	2.6
6	Rice	9	1.5	10.1	72.5	8.4	12.5	4.3	1.5	2.8
7	Bajra	12	3.5	2	78.4	4.9	15.3	5.3	2.5	2.2
8	What bran	16	2.2	15	59.9	8.4	64	14.5	3.6	2.7
9	De-oiled rice bran	17	1.5	18	48.1	18.2	38.2	11.9	4.3	2.1
10	Rice polish	14	14	12	49.2	11.8	19.4	15	3	2.7
11	Brewary grain	25.4	6.5	14.9	48.4	4.8	44	23	5.5	2.4
	Protein concentrates									
1	Soya bean meal	53	1.4	7	36	8.6	18.6	8.8	1.5	2.5
2	Groundnut oil cake	40	8.2	7.4	35.9	7.5	23.3	18.2	3.6	2.8
3	Ground nut meal	44	1	13.2	35.4	6.1	31.2	22.1	3	2.7
4	Cotton seed meal (Decorticated)	41	9.2	6.3	37.8	8.2	28	20	6	2.8
5	Cotton seed meal (Un decorticated)	22.8	9.2	24.1	36.6	7.3	53.9	41.2	11.5	2.5
6	Rapeseed meal	42	1	8.5	48.2	4.7	23.8	15.4	2.4	2.5
7	Sunflower meal (Decorticated)	31	6.7	25.3	27.2	14	39.9	26.9	8.2	1.9
8	Gingelly oil cake	30	10	8	39.2	8.6	14.3	8.2	1.3	2.3
9	Coconut meal	30	0.5	9	54.5	9	37.6	22.2	3.1	2.3

Roughage

Green (succulent) and dry roughage






Green / Succulent Rougage

CO 4/CO 5 grass (Cumbu Nappier Hybrid Grass)

Guinea grass

Para grass

Crude protein:5-7%
Yield: 40 MT/acre/year

Cenchrus ciliaris

Crude protein:5-7%
Yield: 12 MT/acre/year

Sorghum

Maize

Cumbu / Bajra

Crude protein:6-8 %
Yield: 24 MT/acre

Leucerne

Crude protein:18-20%
Yield: 32 MT/acre/year

Hedge leucerne

Crude protein:18-20%
Yield: 50 MT/acre/year

Cow pea

Crude protein:16-18%
Yield: 14 MT/acre

Styloxanthus spp

Crude protein:16-18%
Yield: 14 MT/acre/year

Styloxanthus spp

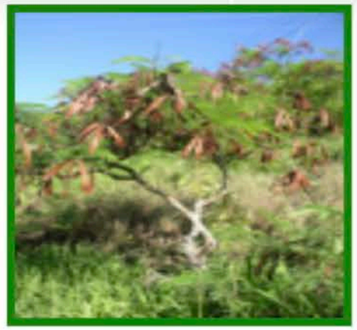
Crude protein:16-18%
Yield: 14 MT/acre/year

Green/ Succulent Fodders

S. No.	Common Name	Botanical Name	Slips/Seed/ Hectare	Period of Harvest (days)	Green fodder yield (MT/Ha)	Crude protein (%)
I	Grass fodders					
1	Napier Bajra hybrid/ Cumbu Napier hybrid grass– CO4 and CO5 grass	*Pennicetum purpuream x Pennicetum americanum*	40,000 nos.	First cut at 60-75 days followed by 45 days interval	350-400	5-7
2	Guinea grass	*Panicum maximum*	66,000 nos.		150-200	5-7
3	Para grass (Buffalo grass)	*Brachiaria mutica*	40,000 nos.	First cut at 75-80 days followed by 45 days interval	80-100	5-7
4	Anjan grass/ Kolukkattai grass (Buffel grass)	*Cenchrus ciliaris, Cenchrus setigerus, Cenchrus Glaucous*	5-8 kg		25-30	5-7
II	Cereal fodders					
1	Fodder Maize	*Zea mays*	40-50 kg	55-60 days	50-55	6-8
2	Fodder Sorghum	*Sorgham bicolar*	40 kg	55-60 days	60-65	6-8
3	Fodder Bajra/cumbu	*Pennisetum glaucum*	8 kg	55-60 days	40-50	8-10
III	Legume fodders					
1	Desmanthus (Velimasal)	*Desmanthus virgatus*	8-10 kg	First cut at 85-90days followed with every 40-45 days	125	18-20
2	Lucerne (Kuthirai masal)	*Medicacago sativa*	15-20 kg	First cut at 60-65 days followed with every 30-35 days	70-80	18-20
3	Cowpea (Karamani)	*Vigna unguiculata*	20-25 kg	50-55 days	30-35	16-18
4	Stylo (Muyalmasal)	*Stylosanthes hamata, S.scabra, S.humilis, S.guianensis*	20-25 kg	65-75 days	30-35	16-18
IV	Tree fodders					
1	Subabul/ Soundal	*Leucaena leucocephala*	7.5-8 kgs or sapplings depends on spacing	After six month every 45-60 days	40-80 ton/hac	15-21
2	Agathi	*Sesbania grandiflora*		After six month every 45-60 days	20-30 kg/tree/year	21-28
3	Gliricidia	*Gliricidia sepium*		After six month every 45-60 days	25-60 kg/tree/year	15-20
4	Vagai	*Albegia lebbeck*	Sapplings depends on spacing	After six month every 45-60 days	10-12 kg/tree/year	16-26

Nutritive value of some common tree fodder

	DCP	TDN
Albizzia lebbek	11.60	49.00
Bahunia variegata	7.90	45.50
Gliricidia sepium	14.00	60.20
Gliricidia maculata	16.99	56.91
Leuceana leucocephala	16.73	70.22
Prosopis cineraria	4.49	40.99
Samanea saman	9.93	57.80



Dry Roughages / Crop Residues

DCP: 0-5 %
TDN : 40-50 %

STRAW

SUNFLOWER PLANT

STOVER

COBS

Feeding of Dairy Cattle

Dry Matter Requirement For Dairy Cattle

Indian dairy cow : 2 - 2.5 % of body weight
crossbreds / buffaloes : 2.5 - 3.0 % of body weight.

Example: An animal weighing 400 kg body weight
DM requirement = 400 x 2.5/100 (or) 3.0/100 = 10 kg (or) 12 kg

Partitioning of Dry Matter

Total dry matter
- 2/3rd roughage
  - 2/3 dry roughage
  - 1/3 green roughage (if green fodder is legume it may be restricted to 1/4 of total roughage ration).
- 1/3 rd concentrate

Partitioning of Dry Matter

For 400 kg dairy cattle: DM requirement : 10-12 kg

1/3rd of dry matter from concentrate.

10 x 1/3 = 3.3 kg.
12 x 1/3 = 4.0 kg

3.3 - 4 kg dry matter from concentrate

2/3rd of dry matter from roughage:

10 x 2/3 = 6.7 kg
12 x 2/3 = 8.0 kg

6.7 - 8 kg dry matter from roughage

1/3rd from green roughage = 2 - 3 kg DM (20-25 kg on fresh matter basis)
2/3rd from dry roughage = 4 - 5 kg

Thumb Rule for Feeding Concentrates for Milk Production in Cattle and Buffaloes

- In case of cattle, for every 1 kg of milk production, 0.4 kg of concentrates should be given.
- In case of buffaloes, for every 1 kg of milk production, 0.5 kg of concentrates should be given.

Green fodder: 20-25 kgs,
Paddy straw: 3-5 kgs.

Concentrate Feed

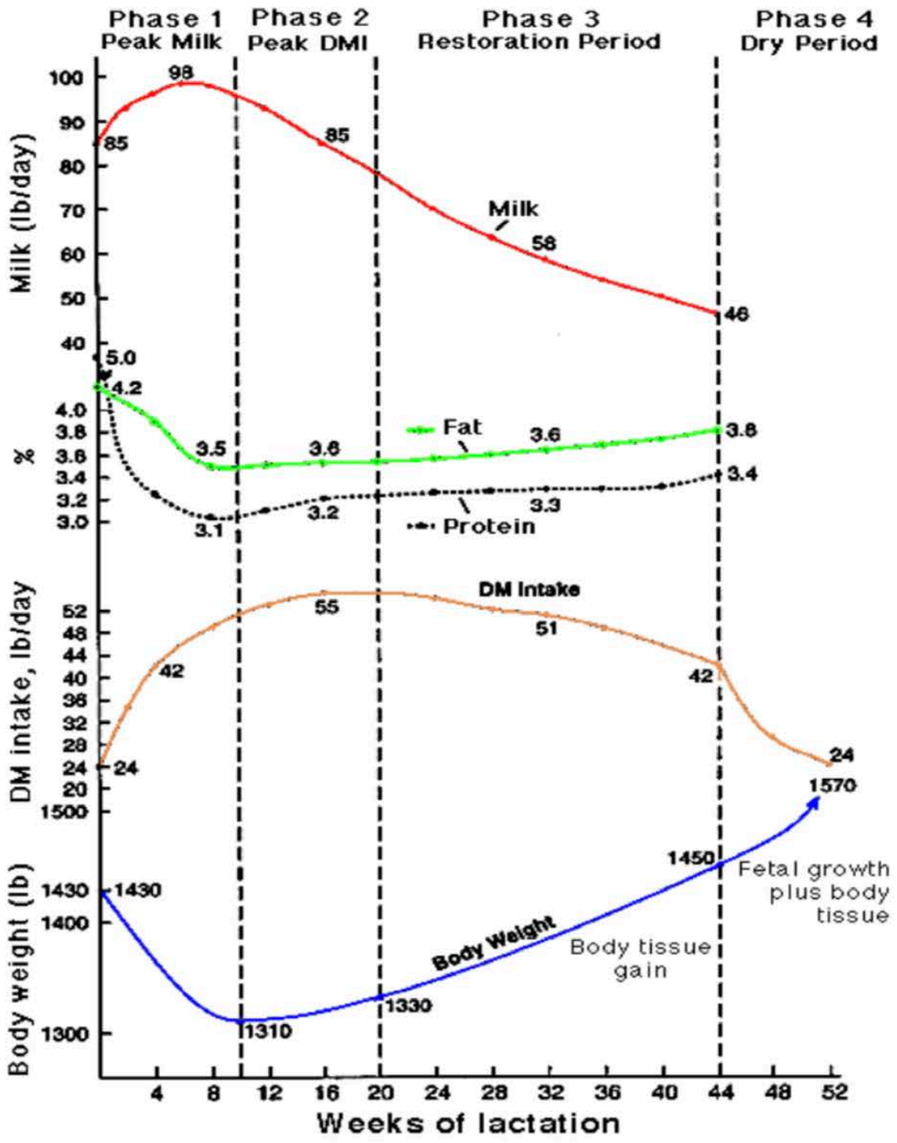
Ingredients	Quantity (kg)
Maize	30
Cumbu	15
Ground nut cake	10
Soyabean meal	5
Rice bran	25
Wheat bran	12
Min mix and	2
salt	1
Total	100

(DCP : 14-16 % and TDN : 65-70 %)

Feeding of Lactating Dairy Cattle

- **Early lactation:** 0-70 days (10 weeks, peak milk production)
- **Peak DM intake:** 70-140 days (20 weeks, declining milk production)
- **Mid and late lactation:** 140-305 days (42 weeks, declining milk production)
- **Dry period:** 60 days and 14 days before the next lactation
- **Transition or close-up period:** 14 days before to parturition

- Lactation cycle phases with corresponding changes in milk production, milk fat percentage, milk protein percentage, DM intake and body weight

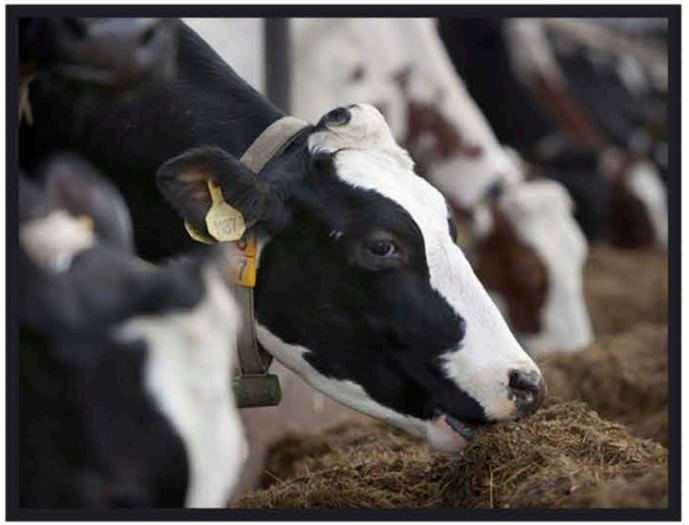


Feeding during peak milk production (0-70 days)

- Milk production increases rapidly during this period
- Dry matter/grain intake should be increased at constant level based on milk production
- Adjust the cow to the milking ration and increase the concentrate about 500 g per day after calving
- Feed several times/day
- Ration should contain adequate energy, protein and amino acids (crude fibre 18 % and crude protein 19 %)
- Low intake causes ketosis
- Feed high quality forages @ 5-20 kg and dry fodder @ 2-5 kg
- Consider adding fat to diets in case of high yielders
- Minimize stress conditions

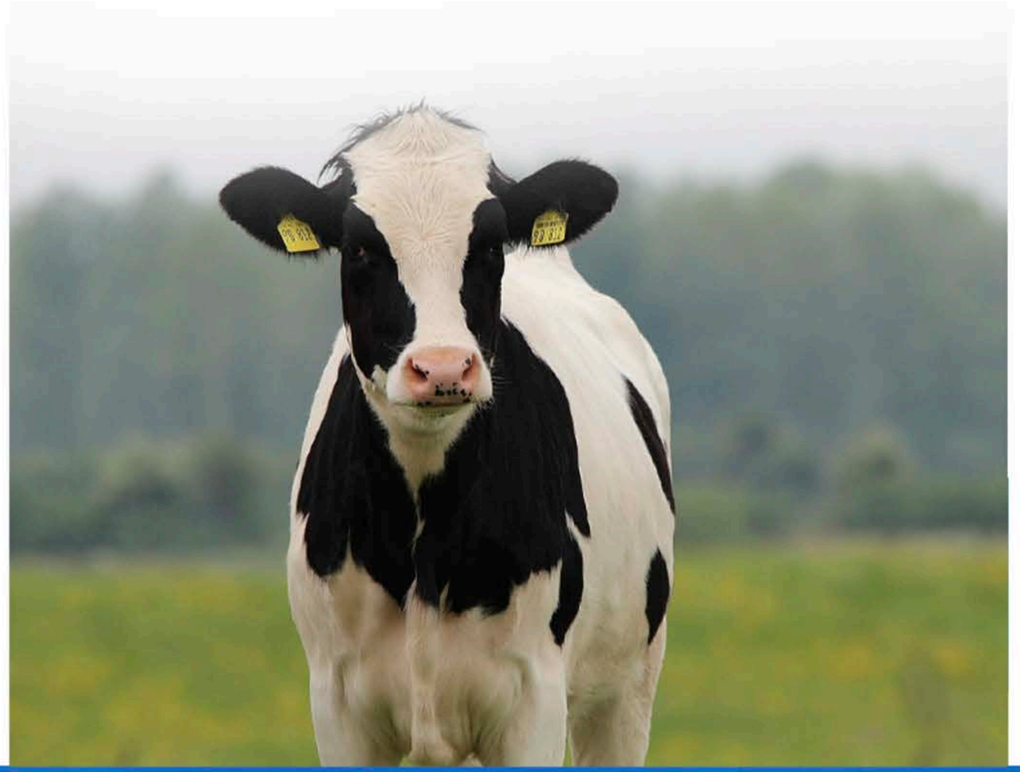
Feeding during mid lactation (70- 140 days) (Peak DM intake)

- Cows should be maintained at peak production as long as possible with maximum feed intake for nutrient needs.
- Feed high concentrate with sufficient roughage
- Feed several times a day.
- Feed high quality forages and concentrates
- Milk production declines, cow is pregnant
- Match feed intake to milk production
- Be careful not to waste feed and over-condition cows



Feeding during mid to late lactation(140-305 days)

- Milk production is declining, the cow is pregnant
- Nutrient intake easily meet the requirements
- Sufficient concentrate and roughage should be given
- Intake based on milk production
- Avoid over-conditioning of cows

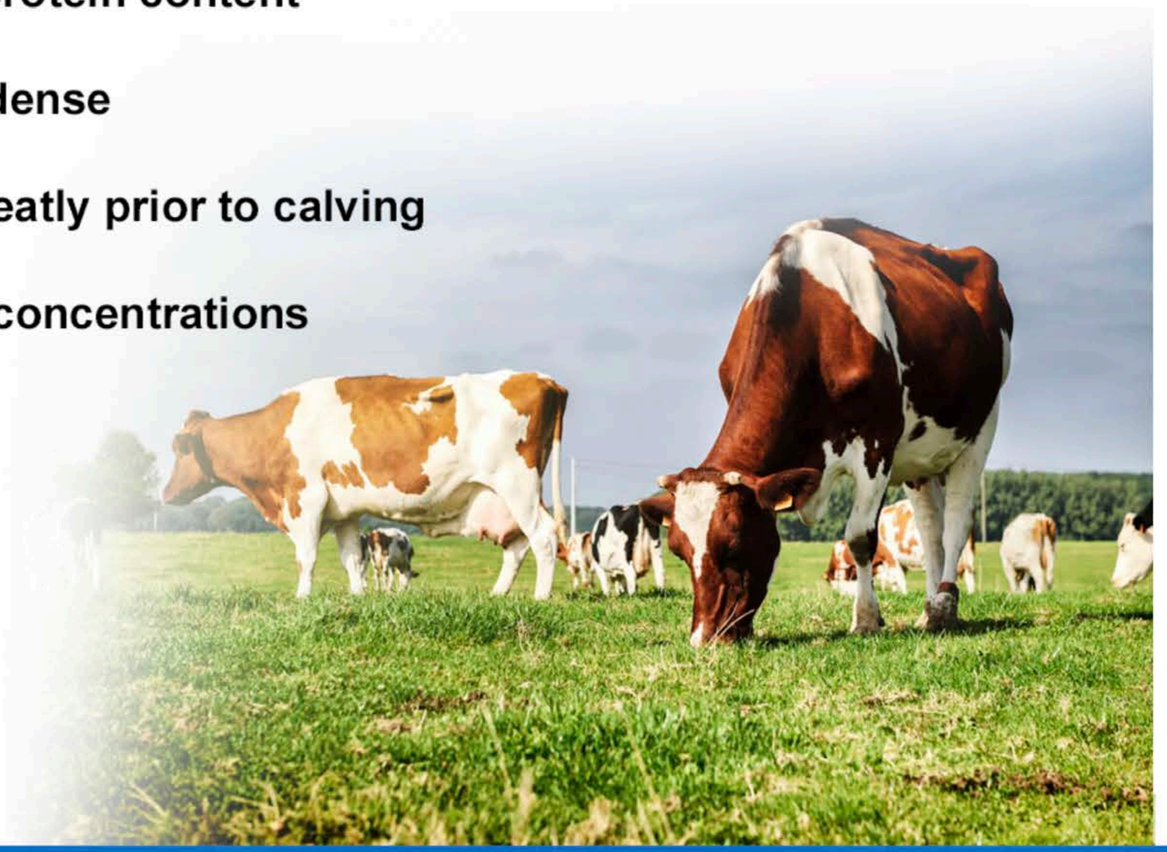


Feeding during dry period (60 - 14 Days pre partum)

- Feed high forage @ 50% of DM intake
- Grain intake should be @ 1% of BW
- Maintain body condition – don't lose weight, may be slight weight gain
- Supplement to support protein, energy, minerals and vitamin requirements
- Drop Ca supplementation levels

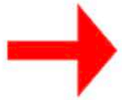
Feeding during transition period (14 days pre partum)

- Transition or close up dry cow feeding program is critical to adjusting dry cows to the lactation ration and preventing metabolic problems
- Increase ration energy & protein content
- Make ration more energy dense
- DMI should be reduced greatly prior to calving
- Feed mineral and vitamin concentrations
- Increase feed palatability



Feeding of Pregnant Animals

- Extra nutrients should be given in the form of concentrates for increasing the body weights during the last term of pregnancy
- Meet nutrient requirements and avoid excessive feeding.
- Animal withstand the stress of parturition and to maintain the persistency of milk production during the subsequent lactation period.
- During the last 3 days prior to calving the concentrate mixture should be reduced and a little warm bran is fed to keep the animal in laxative condition before calving.
- After parturition, the cow should be given
  - Warm water,
  - 1 kg wheat bran,
  - 1-1.5 kg ground / cooked grain
  - 0.5 kg jaggery,
  - 25 g common salt and
  - 25 g mineral mixture.



  - This ration may continued for 3 to 4 days after calving and the regular feed is gradually introduced.
- Avoid excess calcium and phosphorus intakes.
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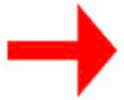

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Ration for cow weighing about 400 kg and producing 10 kg of milk

OPTION	FEED	QUANTITY (KG)
1.	Grasses/Cereal grasses	25
	Legume grasses	15
	Paddy straw	2
	Concentrate mixture	1

The ration for 450 kg body weight of pregnant animal

	DM (kg)	DCP (kg)	TDN (kg)
Requirement		0.42	4.07
Paddy straw	5	0	2.1
Concentrate mixture	3.75	0.52	4.65
(15% DCP and 60-65 % TDN)		0.35	3.38

Conclusion

- Balanced ration will be formulated based on the requirements and feedstuff available in that particular area and fed to dairy cattle
- Ration should include for maintenance and for milk production
- Extra nutrients will be given for last term of pregnancy in pregnant animals
- Metabolic diseases will be prevented by adequate supplementation of energy and protein
- Calcium supplementation will be reduced during the last month of pregnancy to avoid milk fever

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