

FARM NUTRITION NUTRITIONAL REQUIREMENTS OF ANIMALS

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WHAT IS FEED?

- Any substance that can be metabolized by an animal to give energy and build tissues.
- Any solid substance that is used as a source of nourishment.
- Fuel of animal body



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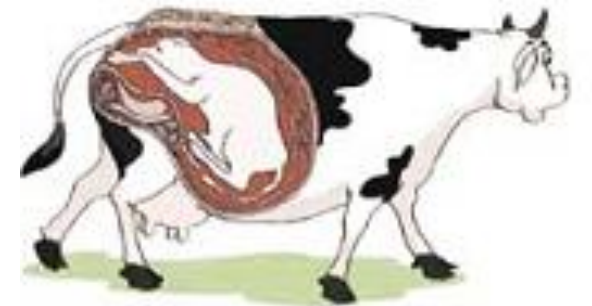


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Why does a cow need to Eat?

- To stay alive (= Maintenance)
- To grow (=Growth)
- To Grow a fetus
(=reproduce and pregnancy)
- To produce Milk (= Lactation)

Note: Requirement for maintenance depends on body weight of cows



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Dairy feed needs to provide

Energy: It is as the fuel for a machine and it is needed for milk production



Protein: The material to build up the muscles, fetus and the milk production



Minerals: They are needed for growth of the bone and the fetus as well as for the milk production



Vitamins: Intervene in the metabolism and the digestion of feeds



Water: Water is needed for maintenance and to produce milk. Water contains about 90% in the milk



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IMPORTANCE OF FEEDING

FEED COST IS USUALLY 55 TO 60% OF TOTAL FARM MILK PRODUCTION COST.

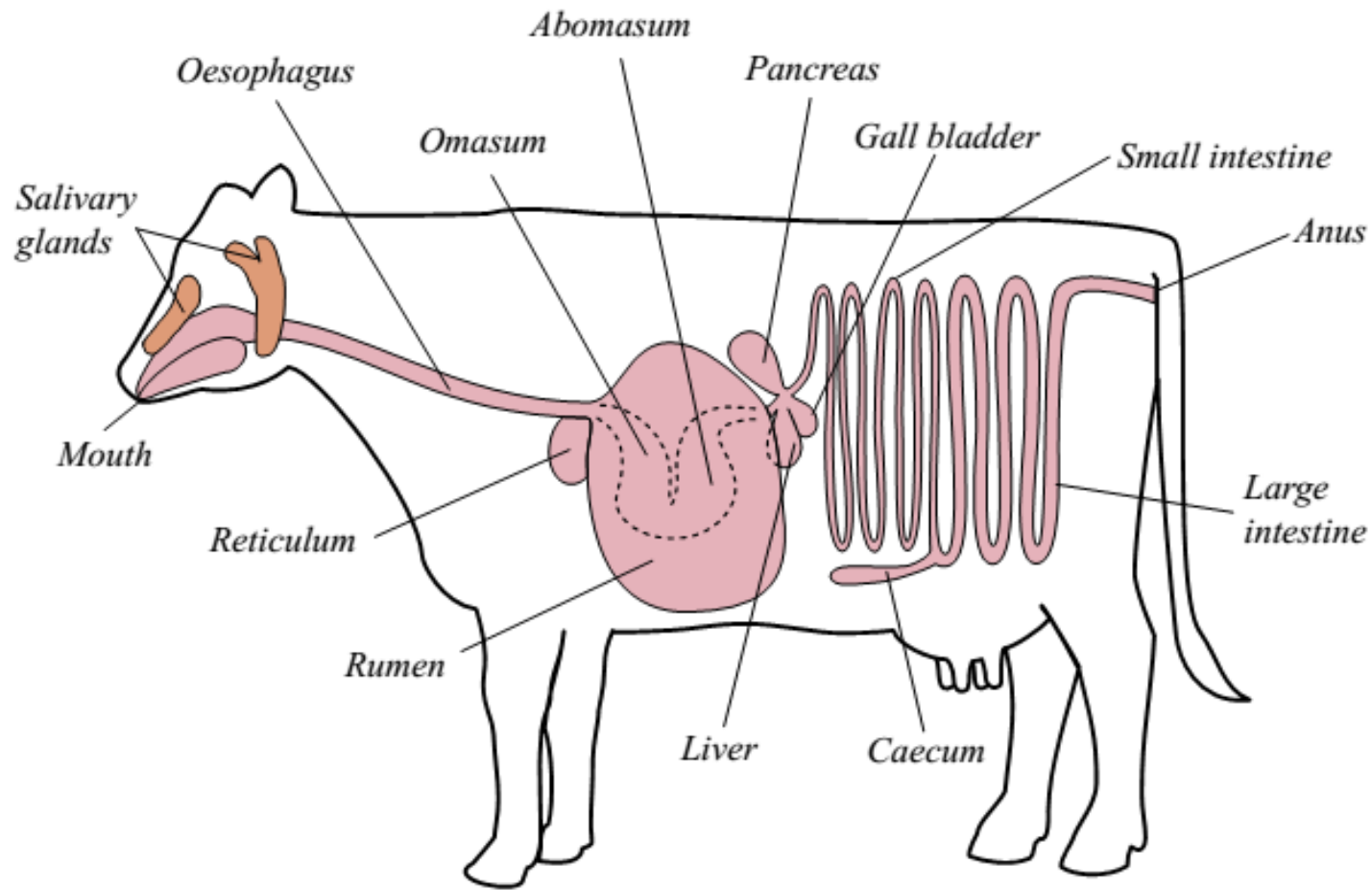


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DIGESTIVE SYSTEM OF RUMINANTS

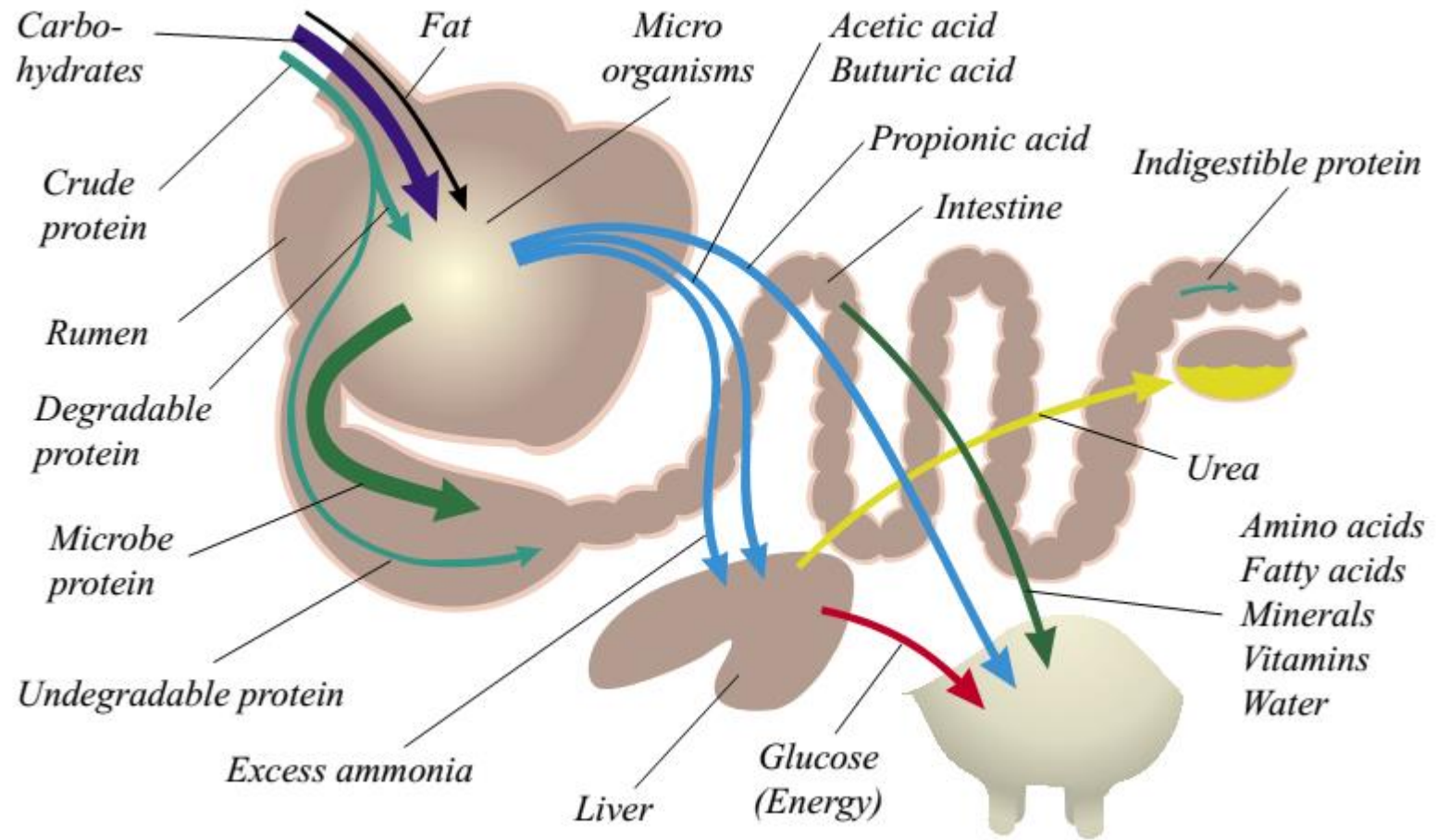


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FATE OF NUTRIENTS in DIGESTIVE SYSTEM



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Components of Feed

- Feed consists of following components
 - Water
 - Macro Elements
 - Carbohydrates
 - Fibers
 - Starch
 - Proteins
 - Fats
 - Micro Elements
 - Minerals
 - Vitamins

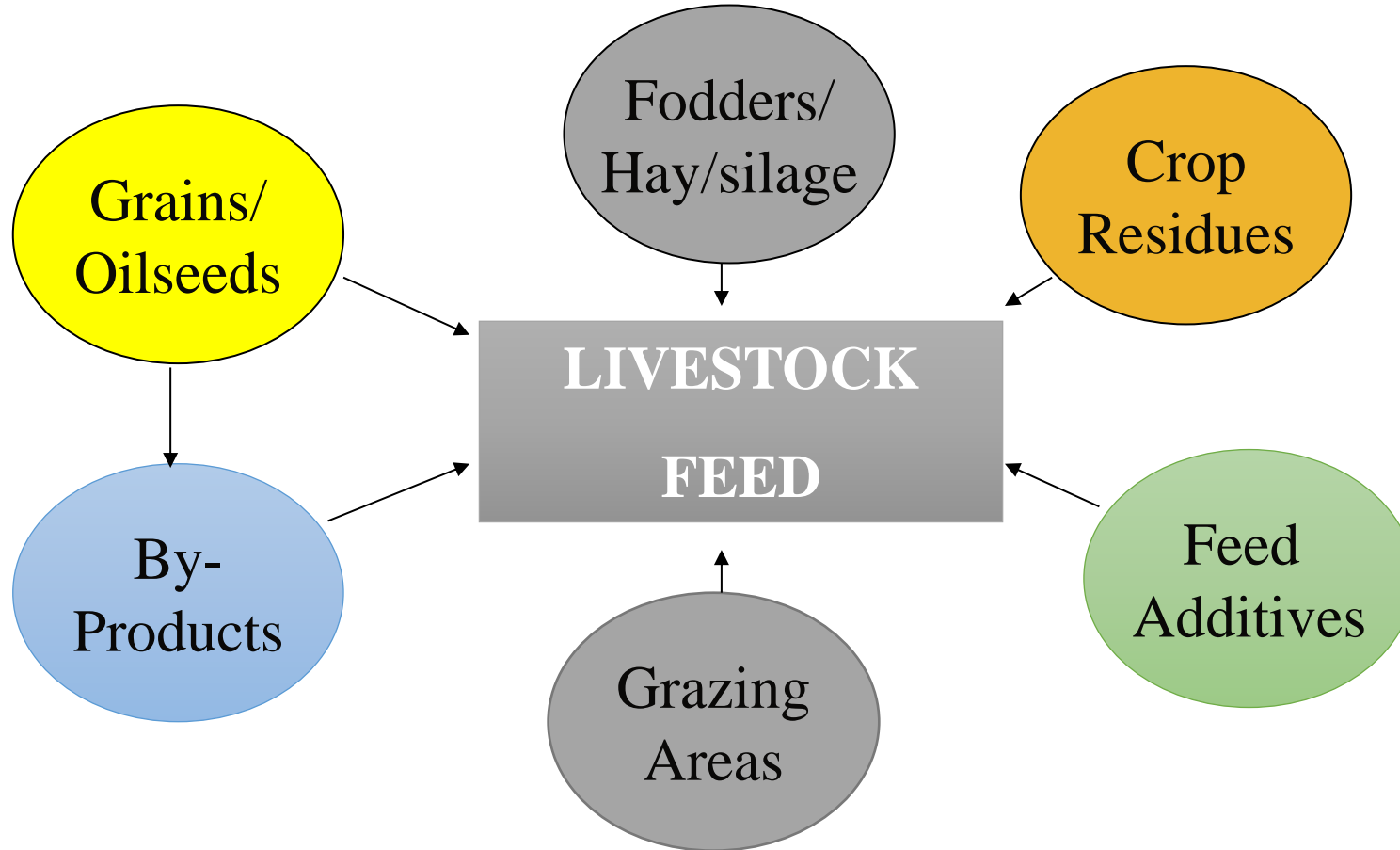


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COMPONENTS OF LIVESTOCK FEED



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OPTIONS FOR FEEDING

- Green Roughage
 - Summer Fodder
 - Maize
 - Sorghum
 - Millet
 - Mott Grass
 - Hybrid Sorghum
 - Elephant Grass



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OPTIONS FOR FEEDING

- Green Roughage
 - Winter Fodder
 - Barseem
 - Alfalfa (Lucerne)
 - Oats
 - Rye Grass
 - Sugarcane tops



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OPTIONS FOR FEEDING

Green Roughage

- Silages
 - Maize
 - Sorghum



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OPTIONS FOR FEEDING

Dry Roughage

- Hay
 - Barseem
 - Alfalfa (Lucerne)
 - Rye Grass
 - Rhodes Grass
- Fillers
 - Wheat Straw
 - Rice Straw
 - Oat Straw
 - Maize/Sorghum Stubble
 - Sugarcane Bagasse



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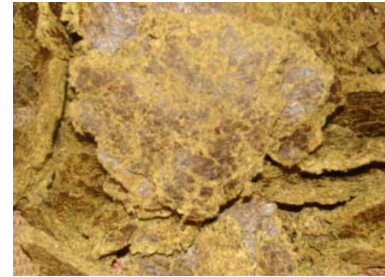


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OPTIONS FOR FEEDING

Concentrates

- Single Ingredient
 - Oil Seed Cakes
 - Grains
 - Agriculture By products
- Balanced Diet (Vanda)
 - Self Made
 - Available in Market



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OPTIONS FOR FEEDING

- Supplementation/Feed Additives
 - Mineral Mixture
 - Urea molasses Block



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OPTIONS FOR FEEDING

- Total Mixed Ration (TMR)



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Composition of Summer Fodders

Type of fodder	Production/acre (Ton)	Dry matter (%)	Protein (%)
Maize	18-20	29.30	7.04
Sorghum	20-25	30.0	6.20
Sadabahar	50-60	27.59	6.98
Millet	20-22	29.50	6.08
Mott Grass	70-90	16.54	7.52
Guara	15-18	20.90	17.35
Rhodes Grass	20 – 24	18.25	11.50 – 12.80



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Composition of Winter Fodders

Type of fodder	Dry Matter (%)	Protein (%)	Yield (Tons/acre)
Berseem	15.62	19.90	30-35
Lucerne	24.26	22.83	52-60
Rye grass	14.21	22.85	30-40
Oats	22.10	8.98	30-35
Cowpea	15	6	20



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COMPOSITION OF DRY FORAGES

Type of fodder	Dry Matter (%)	Protein (%)
Wheat straw	92.75	2.59
Rice straw	92.82	3.06
Maize stoves	82.50	5.45
Sorghum stoves	80.50	3.74
Millet stoves	85.00	4.00
Corn cobs	90.50	1.66
Berseem hay	85.60	18.46
Lucerne hay	87.50	18.86



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COMPOSITION OF COMMON FEED INGREDIENTS

Name of feed ingredient	Protein (%)	TDN (%)
Cotton seed cake	23.04	63.4
Rape seed cake	37.10	79.8
Sunflower cake	30.47	69.8
Cotton seed meal	39.59	79.8
Soybean meal	44 - 48	84.0
Maize gluten feed 20%	21.85	79.1
Maize gluten feed 30%	30.70	83.6
Maize gluten feed 60%	64.70	94.6
Coconut meal	19.5	



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COMPOSITION OF COMMON FEED INGREDIENTS

Name of feed ingredient	Protein (%)	TDN (%)
Rice polishing	12.36	89.9
Wheat bran	14.99	71.0
Wheat grains	12.80	78.9
Maize grains	9.80	81.2
Sorghum	15.75	78.5
Millet	10.55	77.2
Oats	10.21	77.2
Oil	00.00	195.0
Grams (black)	20.35	75.2
Urea	287.50	-
Bone meal	20.05	57.7



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Balanced Feed/Diet

- Such feed that contains sufficient amounts of all the components of feed as requirement of animals, to provide good health.
- Feed should provide an appropriate amount of energy and adequate amount of water.

i.e. Balanced Feed should be

- Adequate
- Wholesome



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Water



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Water Requirement

Water is not considered as a real nutrient.

Vital role in the functioning of the body, milk production, and the total intake of food (DMI).

The daily requirement of water is influenced by a number of factors.



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Water Requirement

TABLE 1. WATER CONSUMPTION OF DAIRY CATTLE.^a

DRINKING WATER ONLY

<i>Class of Cattle</i>	<i>Age or Condition</i>	<i>Gallons Per Day^b</i>
Holstein Calves	1 month	1.3 to 2.0
Holstein Calves	2 months	1.5 to 2.4
Holstein Calves	3 months	2.1 to 2.8
Holstein Calves	4 months	3.0 to 3.5
Holstein Heifers	5 months	3.8 to 4.6
Holstein Heifers	15 to 18 months	5.9 to 7.1
Holstein Heifers	18 to 24 months	7.3 to 9.6
Jersey Cows	30 lbs milk/day	13.0 to 15.5
Guernsey Cows	30 lbs milk/day	13.8 to 16.0
Ayrshire, Brown Swiss, and Holstein Cows	30 lbs milk/day	14.5 to 17.0
Ayrshire, Brown Swiss, and Holstein Cows	50 lbs milk/day	24.0 to 27.0
Dry Cows	Pregnant, 6 to 9 months	9.0 to 13.0

WATER INTAKE FROM FEED AND DRINKING WATER

Milk Cows 4.5 to 5.0 lbs/lb milk produced daily



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Stages of A Dairy Cow

- Calf
- Heifer
- Dry Cow
- Close-up Cow
- Lactating Cow
- Fattening animals



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THE PHASES DURING A LACTATION CYCLE

A dairy cow produces milk for about 305 days, followed by a dry period of about 60 days.

During such cycle of 365 days, several aspects of the cow depend largely on the stage of lactation:

The milk production:

- ◆ Peaks 5-6 weeks into the lactation and gradually decreases until the end of the lactation.

The body weight:

- ◆ Is lowest 10 to 14 weeks into the lactation and increases gradually until next calving

The DM intake:

- ◆ Peaks 16 to 24 weeks into the lactation and decreases gradually until next calving

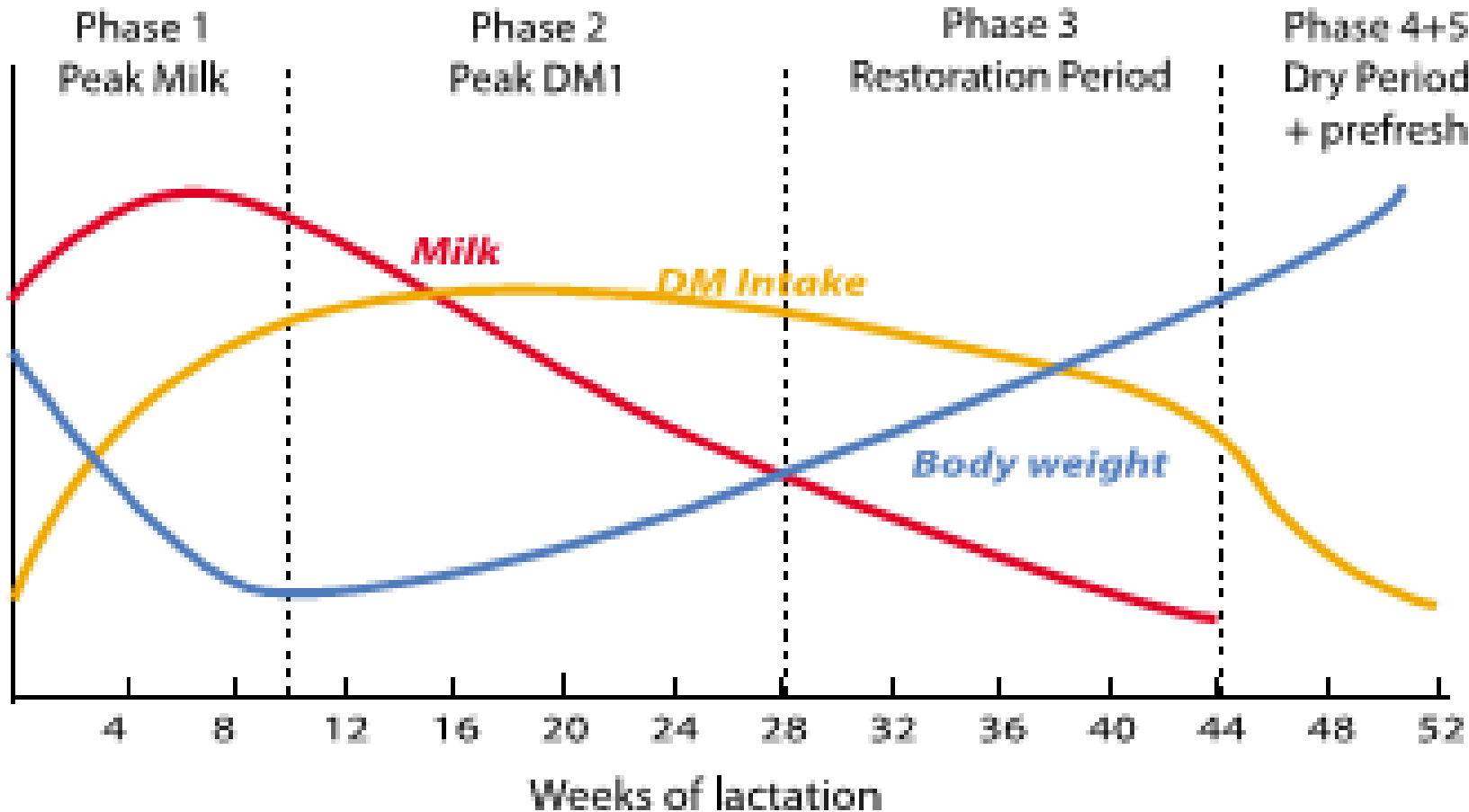


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THE PHASES DURING A LACTATION CYCLE



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THE PHASES DURING A LACTATION CYCLE

Nutritional requirements vary with the stage of lactation. For feeding practices, we define 5 distinct phases during this 365-day period

- 1- Phase 1:** Early lactation: 0 to 70 DIM (Days In Milk) (peak milk production)
- 2- Phase 2:** Mid lactation: 70 to 200 DIM (peak DM feed intake)
- 3- Phase 3:** Late lactation: 200 to 305 DIM (restoration phase)
- 4- Phase 4:** Dry period: 60 to 14 days before the next lactation
- 5- Phase 5:** Transition or close-up period: 14 days before to calving

Phase	Milking			Dry	
	I	II	III	IV	V
	Early (0-70 DIM)	Mid (70-200 DIM)	Late (200- 305DIM)	Dry (60 days before calving)	Prefresh (14 day before calving)
CP,% of DM	17.5-19.5	15-17	14-15	12	14.5-15
Ration forage min, %	40-45	45-50	50-55	60	55
ADF min, % of DM	17-21	19-22	21-25	30-35	25-29



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Quick and Simple Equation for Dairy Animals

- $\text{DMI (kg/day)} = (0.0968 \times \text{BW}^{0.75}) + (0.372 \times \text{kg FCM})$
- $\text{FCM} = (0.4 \times \text{kg milk}) + (15 \times \text{kg fat})$

- 635 kg cow, 36 kg milk, 3.5% fat
- $\text{FCM} = (0.4 \times 36) + (15 \times 1.26) = 32.8$
- $\text{DMI} = (0.0968 \times 6350.75) + (0.372 \times 32.8)$
24.7 kg/day or 49.7 lb/day



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MAINTENANCE REQUIREMENTS FOR DAIRY CATTLE

LIVE WEIGHT	NET ENERGY OF LACTATION	CRUDE PROTEIN	MINERALS		VITAMINS	
			Ca	P	A	D
Kgs	Mcal	gms	gms	gms	1000 i.u.	1000 i.u.
400	7.16	318	16	11	30	12
450	7.46	341	18	13	34	14
500	8.46	364	20	14	38	15
550	9.09	386	22	16	42	17
600	9.7	406	24	17	46	18
650	10.3	428	26	19	49	20
700	10.89	449	28	20	53	21
750	11.47	468	30	21	57	23
800	12.03	486	32	23	61	24



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LAST 2 MONTHS PREGNANCY + MAINTENANCE REQUIREMENTS

LIVE WEIGHT	NET ENERGY OF LACTATION	CRUDE PROTEIN	MINERALS		VITAMINS	
			Ca	P	A	D
Kgs	Mcal	gms	gms	gms	1000 i.u.	1000 i.u.
400	9.3	875	26	16	30	12
450	10.16	928	30	18	34	14
500	11	978	33	20	38	15
550	11.81	1027	36	22	42	17
600	12.61	1074	39	24	46	18
650	13.39	1120	43	26	49	20
700	14.15	1165	46	28	53	21
750	14.9	1209	49	30	57	23
800	15.64	1254	53	32	61	24



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REQUIREMENTS FOR MILK PRODUCTION PER LITER (FAT % BASIS)

FAT CONTENT	NET ENERGY OF LACTATION	CRUDE PROTEIN	MINERALS		VITAMINS	
			Ca	P	A	D
%	Mcal	gms	gms	gms	1000 i.u.	1000 i.u.
3	0.64	78	2.73	1.68	-	-
3.5	0.69	84	2.97	1.83	-	-
4	0.74	90	3.21	1.98	-	-
4.5	0.78	96	3.45	2.13	-	-
5	0.83	101	3.69	2.28	-	-
5.5	0.88	107	3.93	2.43	-	-



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REQUIREMENTS FOR FATTENING ANIMALS GROWTH RATE BASIS

ADG (Body Wt.) kg/d	DMI kg/d	TDN Kg/day	Total NE Mcal/d	CP g/d	CP %	Ca g/d	P g/d
0.5 (140 KG)	3.77	2.18	4.37	432	11.5	18.2	8.6
1.1 (140 KG)	3.95	2.68	5.83	732	18.5	37.7	16.8
0.5 (180 KG)	4.68	2.73	5.42	491	10.5	18.6	9.5
1.1 (180 KG)	4.86	3.32	7.23	786	16.2	36.8	16.8
0.5 (200 KG)	5.12	2.98	5.92	516	10.1	18.9	9.8
1.1 (200 KG)	5.32	3.62	7.89	811	15.3	36.6	16.8
0.5 (225 KG)	5.55	3.23	6.41	541	9.8	19.1	10.0
1.1 (225 KG)	5.77	3.91	8.55	836	14.5	36.4	16.8
0.5 (250 KG)	5.94	3.46	6.88	568	9.6	19.6	10.5
1.1 (250 KG)	6.18	4.21	9.18	861	14.0	36.0	17.1
0.5 (275 KG)	6.32	3.68	7.35	595	9.4	20.0	10.9
1.1 (275 KG)	6.59	4.50	9.8	886	13.5	35.5	17.3
0.9 (295 KG)	7.00	4.55	9.51	818	11.7	30.3	15.7
1.1 (295 KG)	7.00	4.78	10.40	914	13.1	35.3	17.5
0.5 (315 KG)	7.09	4.09	8.25	645	9.1	20.5	11.8
1.1 (315 KG)	7.41	5.05	11.00	941	12.7	35.0	17.7
0.5 (370 KG)	7.86	4.55	9.12	686	8.7	21.4	12.7
1.1 (370 KG)	8.23	5.59	12.16	968	11.8	34.5	17.7



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THE BASIC OF GOOD FEEDING MANAGEMENT



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Farmers raise dairy cows to produce milk and to make a profit.

Feeding is the biggest cost in milk production.

Improving feeding should focus on:

- ◆ Maximise the of potential milk production of cow
- ◆ Decrease the cost of production

TWO basic principles are:

1. THE MORE A COW CAN EAT, THE MORE MILK SHE CAN PRODUCE!

- ◆ Always try to increase the feed intake of your cows!

2. FORAGES ARE CHEAP, CONCENTRATES ARE EXPENSIVE!

- ◆ A dairy cow should eat as much good quality forages as possible:
- ◆ The more nutrition we can provide inside the forages, the less concentrate we need to add, the cheaper the diet!



Cheap!



Expensive!



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Best Dairy Technology



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Some rules of the good feeding management

Rule 1: Water is always available

- ◆ Cows need a lot of water.
- ◆ It should be available at all time, clean, tasty and fresh

Rule 2: Feed forages *ad libitum*

- ◆ Forages should always be available in the feeding trough
- ◆ If there is no feed, dry matter intake is low and they produce less milk

Rule 3: Provide concentrate in small amounts

- ◆ Too much concentrate at one time is not healthy for a cow
- ◆ Concentrate should be provided at least 3 times per day
- ◆ It is best way to mix forages and concentrate

Rule 4: Always provide a mineral block

- ◆ Cows know when they need more minerals
- ◆ A mineral block guarantees that cows take up sufficient minerals

Rule 5: Increase forage intake as much as possible

- ◆ The more they eat, the more they produce
- ◆ Forage are cheap, concentrates expensive
- ◆ WHAT you give and HOW you give it will largely determine the feed intake!

Rule 6: New feedstuff or ration should always be introduced gradually

- ◆ The rumen bacteria change according to the diet
- ◆ New feeds need to be introduced step by step, a little bit more every day for 7 to 10 days



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- Forage to Conc Ratio
 - The “art” of dairy ration formulation typically followed the guidelines that the forage : concentrate (F:C) ratio should be between 40:60 and 60:40.
 - Higher producing cows need rations with ratios closer to 40:60 and higher quality forages allow ratios to be closer to 60:40.



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FORMULATION DAILY RATIONS FOR MILKING COWS

1. Find Out The Nutrient Requirement Of The Cow Or The Group Of Cows
2. Find Out The Feedstuffs Available
3. Define The Ratio Of Feedstuffs, According To The Potential Dry Matter Intake Of Cows And The Recommended Maximum Ratios Of Feedstuffs
4. NEL And Crude Protein Contents Of The Ration Is Calculated And Compared With The Requirements
5. Check The Ca And P Supply. If Necessary Use Ca And P Supplements. If Both Minerals Are Missing, Use The P Supplement First, Since It Contains Also Ca. The Final Deficiency Of Ca Can Be Supplied With Limestone.
6. Check The Fibre Content Of The Ration ($20\pm 3\%$ Of The Dry Matter Intake)
7. Ruminants Can Feed About 8-10% Green Forages, 3-5% Silages, And 0,5-1% Hays Of Their Live Weight.



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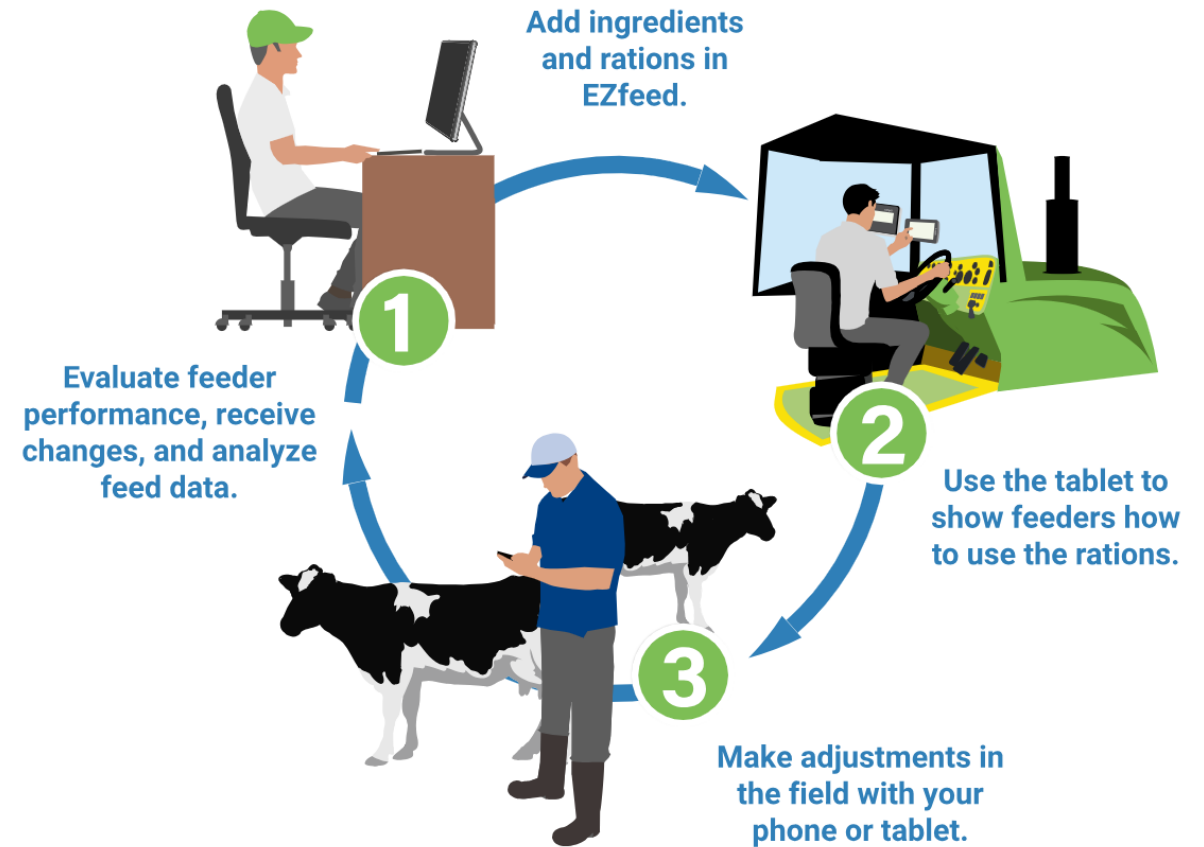


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RATIONS FORMULATION

Type of Rations Delivered to the Cow

- The ration on paper
- The ration in the bunk
- The Ration in front of Cows
- The ration consumed by the cow
- The ration absorbed in the blood stream.



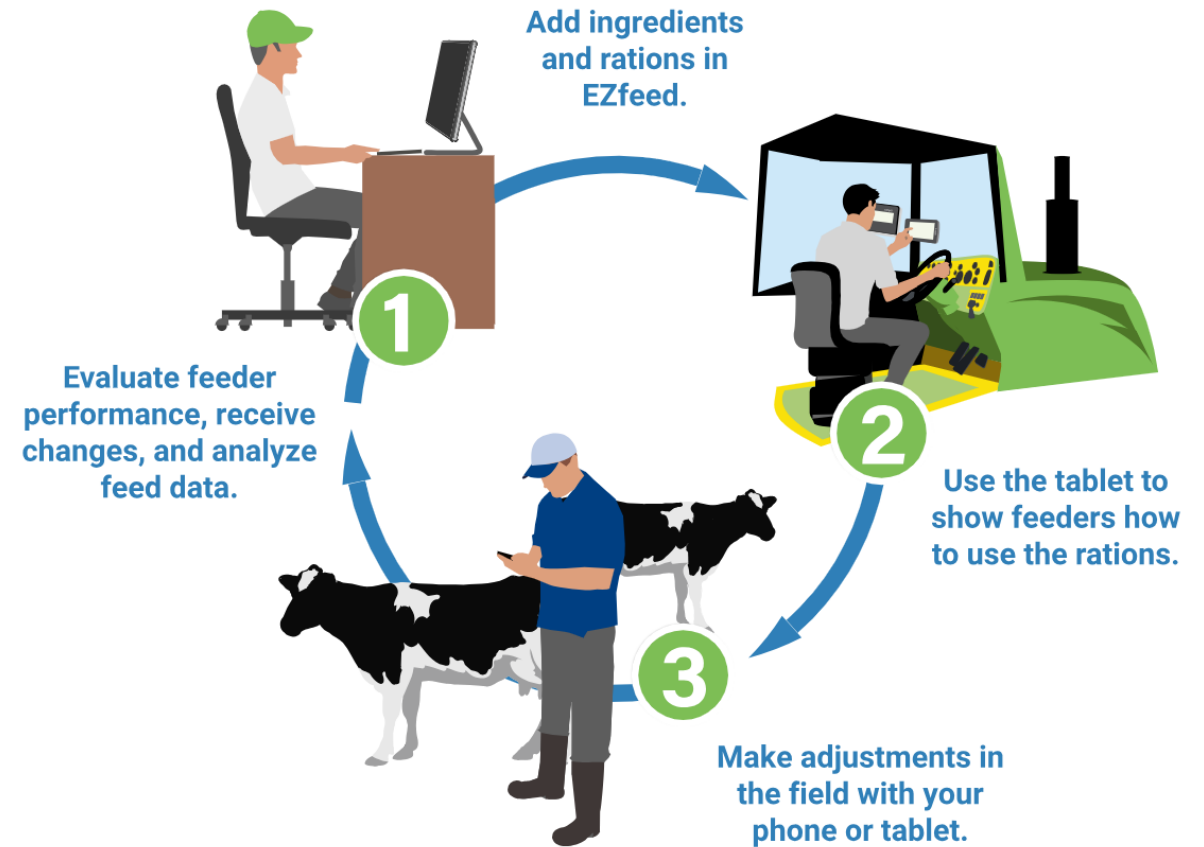
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RATIONS FORMULATION

- Start with forages
- determine energy/protein supplement needs
- Monitor DMI, CP, NEL, and ADF you change ingredient amounts
- ADF-NDF spread about 10 pts
- By-products 15-25 pt spread
- Minerals and vitamins
- Commercial grain mix or mineral pack



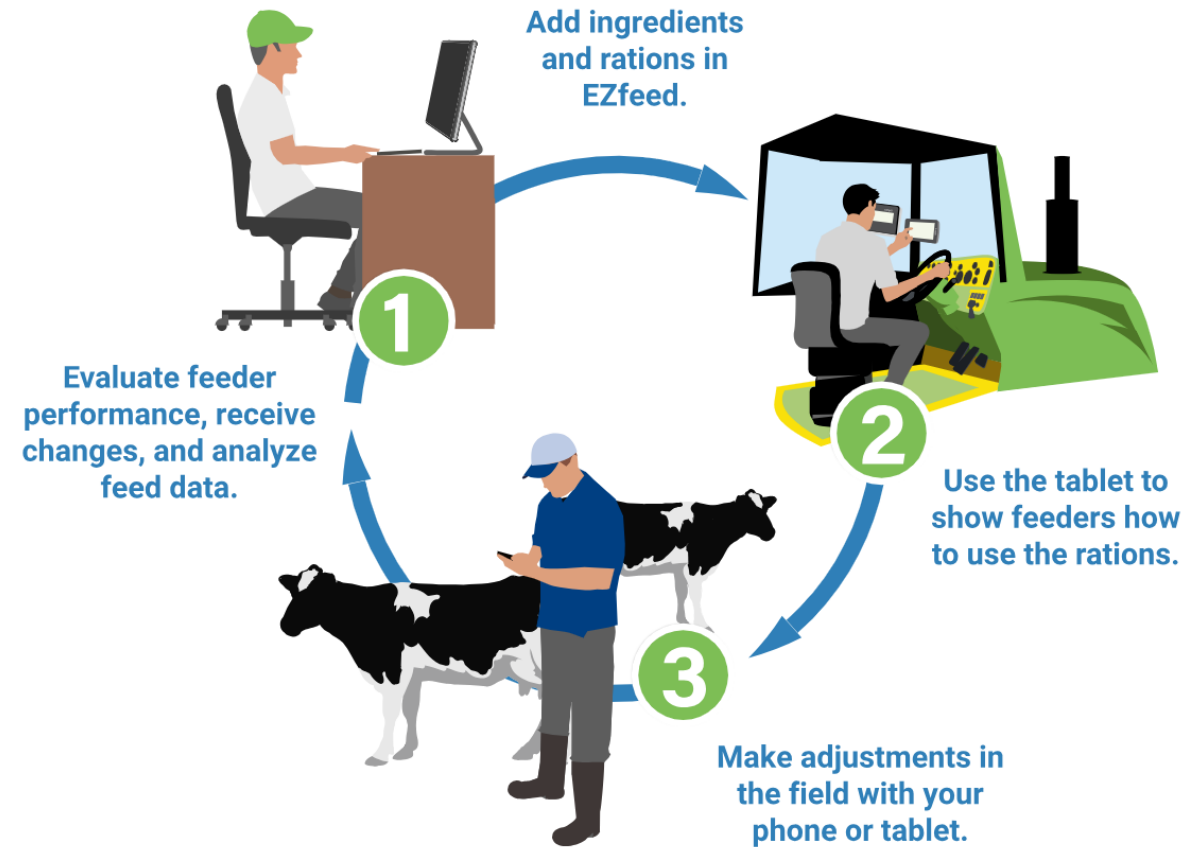
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RATIONS FORMULATION

- Exercises



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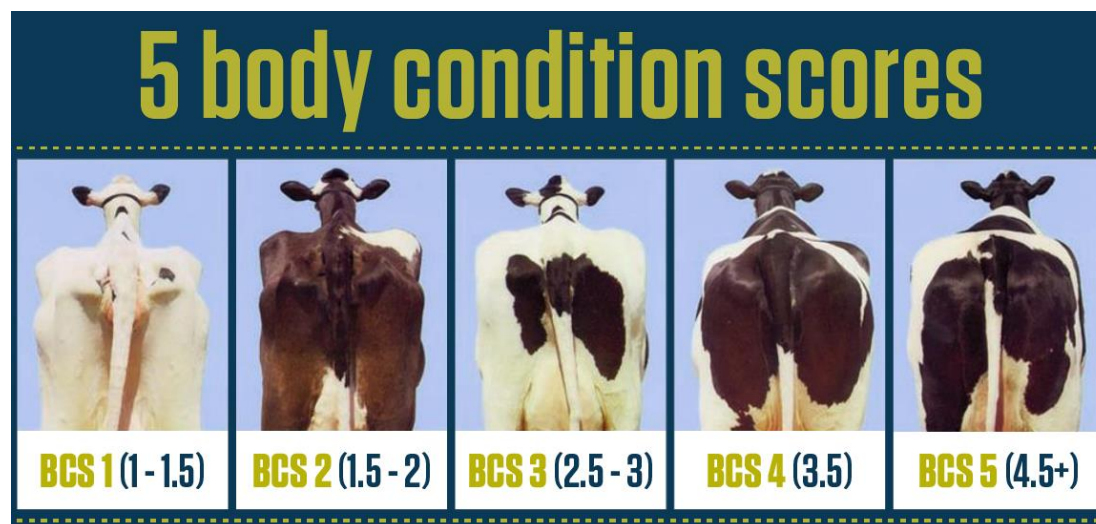
DIFFERENCE BETWEEN DAIRY & FATTENING NUTRITION

Target for Dairy animals

- Heifer Average Daily Gain 900 grams.
- Body Condition Score 2.5 to 3.5.
- Angular Lean Appearance.

Target for Fattening animals

- Fattening Average Daily Gain above 1000 grams.
- Body Condition Score 3.5 to 4.5
- Muscular Appearance.



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QUESTIONS



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THANK YOU FOR PARTICIPATION



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