Feeding systems, forages, alternative feedstuffs, ration balancing program, feed technologies for profitable dairying

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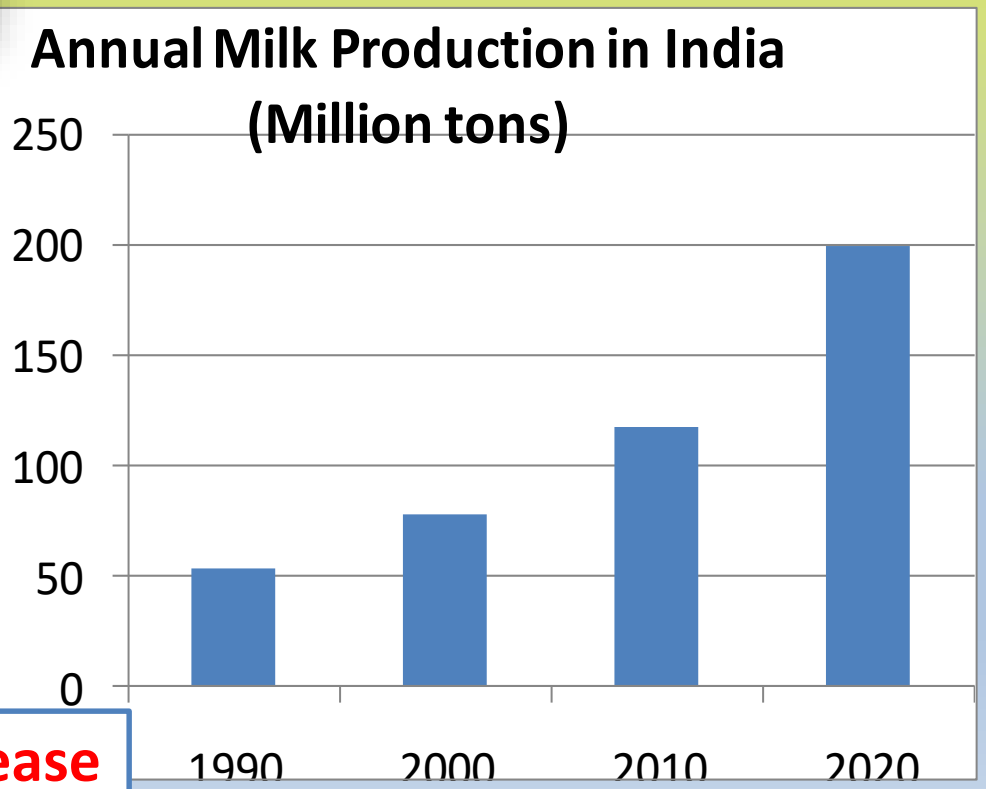


30 years period – 4 times increase

feeding schedule for dairy calf

Age	Milk	Concentrates	Green grass	Dry fodder
1-5 days	2 litres	-	-	-
6-30 days	2 litres	50-250 g	Handfull of grass	-
30-60 days	2 litres	250-500 g	Adlibidum	Dry fodder
61-90 days	Reduce milk gradually	500-750 g	Ad libidum	Dry fodder
3 to 6 months	-	750-1000g	Ad libidum	Dry fodder
6 to 12 months	-	1-1.5 kg	Ad libidum	Dry fodder

Normal growth

- Body weight recorded at
- With in 8 hours of birth
- Weekly up to 4 months of age
- Bimonthly up to 6 months
- Monthly after 6 months of age
- Formula L X G 2/300 inches

Normal body weight of heifers at different age				
Age	Zebu cattle	H.F.	JERSEY	BUFFALO
AT BIRTH	20-25 Kg	43	25	25-30
6 months	82-102	170	113	110-126
12 months	150-185	307	216	180-236
18 months	200-236	398	282	250-300
24 months	250-274	500	352	350-372

Check points to over come reproductive problems

Heifers :

Daily body weight gain should be -24 months- 250-300 kg

Regular feeding of 1-1.5kg concentrates

Milch cow:

Ration – 40 - 60% concentrates & 40-60% roughages

Regular supplementation of

Mineral mixtures, Vitamins ,Salt and Buffers

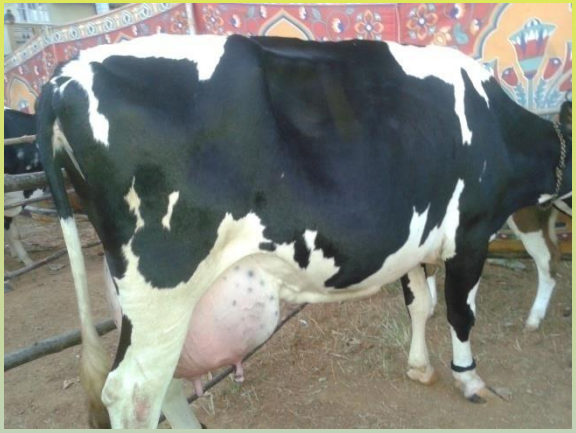
Under Field Conditions

Milk Quality Issues

Low milk fat, Low SNF

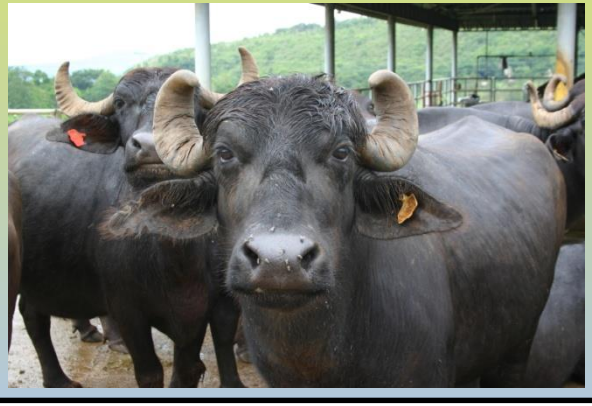
Not a problem of many farmers

Breed factor



Low fat – High yielding HF pure and Crossbreds

Heritability : > 50 %



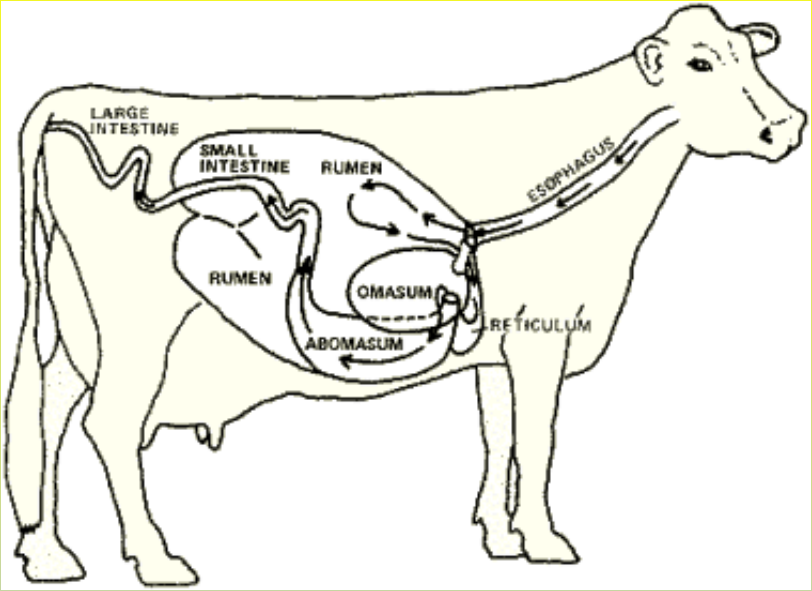
Indigenous cattle and Buffaloes

Fat and SNF – not a major problem

Milk fat & SNF is not a major problem in Jersey cows

Breed and milk yield

Rumen - Digestion of Nutrients



RUMEN : Site of maximum digestion

Fodder – Fibre is the key for optimum digestion in rumen

Rumen - Precursors of milk fat – Udder

Low fiber / fodder intake

Precursors - Short and medium chain fatty acids from rumen.

Udder – Main site of fat synthesis (Triglycerides).

Low fibre intake - Low acetate and butyrate production in rumen and hence low milk fat synthesis.

Minimum 30% fibre (Neutral detergent fibre) in the whole dietary dry matter is required. Either through green fodder or dry fodder, at least 1% body weight of cow.

Ex. 400 kg body weight, 4 kg NDF dry matter, Green fodder (fresh basis about 25 kg) or dry fodder about 4.5 kg. Combination at 70 GF : 30 DF is desirable.

Chaff the fodder to about 1-2 inch length and feed.

Too much fine grinding of feed also not desirable (Inadequate rumen fermentation, low milk fat and low SNF)

4 -5 mm particle size of feed ingredients is ideal

Green Fodder - Key for Production and milk quality







Source of fibre for rumen function

Adequate fodder intake: Milk quality not an issue

Chaffing of fodder is necessary

Reduce Wastage

Improves Digestion

Fodder Maize – African Tall

Single cut : 65-70 days

King of green fodder, Lactogenic

Irrigation required, 35-40 ton/ ha

Intercrop cereal and legume fodders

Improves soil fertility, fodder yield
Protein content of fodder

Multicut Perennial - Cereal Fodder Varieties

Drought Resistant – Fodders of Future

Sorghum COFS 29

CO FS 29/31 - Perennial variety (3 years)

Profuse tillering (side shoots-multiple stems), Highly leafy

Climate resilient

No. of cuts/ Year : 5

Yield:160 to 180 t/ha/year

Good for silage and stover

Multicut Bajra - BAIF 1

- Developed from Giant bajra variety and Napier grass
- Soft, succulent & juicy stem
- 60 days after sowing- First cutting
- Later cuts @45 days interval
- Mean GF yield: 38 tons/ha / cut

BAIF Napier Hybrid-10 (BNH-10)
Bajra x Napier cross
Perinneal, Profuse tillering,(side shoots-multiple stems) 6-8 cuts
40 ton/ha/cut

Crossing Programme: Maize x Teosinte

Multicut Maize ???

- Teosinte – Wild grass variety of Zea species
- Dual cut fodder maize variety
- Increase leafy part

BAIF- Research under progress

Non-cereal Perinneal Fodders

Hybrid Napier Bajra varieties

High biomass yielding CO (CN) 4

Co-5

IGFRI- Sampoorna (DHN-6) – High yielding 40-45 ton / cut

Require Irrigation

Popular varieties of Hybrid Napier Bajra

Co-5

DHN-6 (‘Sampoorna’)

Super Napier - Thailand

More Biomass, more protein, sustains growth in winter months

POPULAR NOW

Guinea grass

- Palatable fodder
- Shade tolerant, most suited Orchards, less water
- Varieties: DGG-1, Bundel guinea-2, PGG-19, Co GG-3
- Propagation: 3 kg seed or 40,000 root slips

➢ Fodder yield : Over 130 tons in six cuts / year

Co GG-3

DGG-1

Lucerne

Stylo

Cowpea

Siratro

Butterfly pea

Green gram

Horse gram

Sesbania

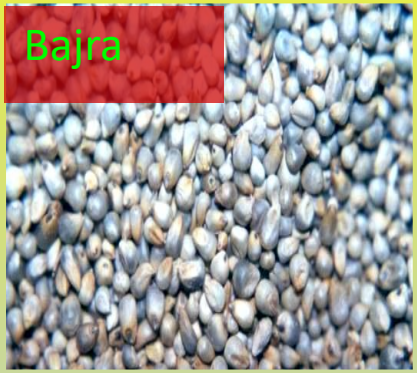
Climate resilient

Suitable for dry regions

Alley cropping

Melia (Azadirachta) + H.Napier

Concentrate



Wheat

Rice

Ragi

Little Millet

Rice Bran

Wheat Bran

Bran-outer pericarp, laxative,CP-14%, CF-14%,

Deoiled rice bran

Rice polish

DORB – low in energy (TDN-60-70%, ME-1800 Kcal/kg, good keeping quality

Rice polish- oil – 17% rich in USFA, poor keeping quality

Protein Sources

Maize gluten meal

Maize germ meal

Gluten (wheat, maize) rich in protein, poor in protein quality- 65 % crude protein-used as protein source- by product of maize starch –wet milling process

Germ rich in oil (40-50%) high USFA

Alternate feed resources and technologies for their optimal usage

Reducing the cost of feeding

Use of local resources

Replacing costly conventional resources

Ration balancing – Optimum usage

Alternate Feeds / Non- Traditional feeds

Generally not used on a regular basis though fairly good in nutritive value - Lack of adequate data, limited availability and fear of untoward effects upon feeding.

Lot of research has been done – To some extent they are being used – Awareness, Extension

DRY FODDER - ALTERNATES

Sunflower Head as Dry Fodder

Sunflower head is a residue after extraction of seeds

Crushed sunflower head has a crude protein content of 7-10%, fibre content of 45-50% and dry matter digestibility of 50-55%

It can be included in total mixed ration upto 40% as roughage source

No adverse effects have been found after feeding sunflower head based total mixed ration

Sugarcane trash as dry fodder

Sugarcane trash is the dry sheath left in the field after sugar cane is harvested. It is generally burnt or used for mulching purpose

The nutritive value of sugarcane trash is comparable to finger millet straw in terms of crude protein and fibre

Palatability and intake of sugarcane trash is comparable to finger millet straw
It can be used as an alternate dry fodder for ruminants

Areca Sheath as Dry fodder

Nutrient Composition (DM basis)

Nutrient	Paddy straw	Areca sheath
CP(%)	3.8	3.3
EE(%)	0.1	0.07
Ash(%)	17.1	6.4
AIA(%)	13.6	3.3 *
NDF(%)	72.1	71.3
ADF(%)	51.1	47.7
ME (M cal)	1.76	1.81
TDN (%)	48.2	49.3
Lignin(%)	4.8	3.9 *
Oxalic acid (%)	0.56	0.34 *
IVOMD (%)	50.9	51.5

Less lignin

less oxalic acid (ANF)

Less silica

More digestible as compared to paddy straw

Dried Areca Sheath - Shredding to pieces of about 10-15 mm size is desired

Can be mixed with other feed ingredients, sprinkle water and fed to cattle

Marketing Shredded Areca Sheath as Dry Fodder

Areca sheath as dry fodder in Andaman islands

Groundnut Haulms

Legume straw, good for sheep/goat

Maize dry fodder / stover: Left in field or burnt

Maize cobbs and sheath as dry fodder

Dried maize cobbs and its sheath after grain removal are good source of roughage – 5% mix with green silage - pliable

Maize cobbs are quite hard and need to be shredded to small pieces

They contain crude protein of 3-4% and 40-45% good quality fibre

They can be used as dry fodder in place of paddy and ragi straw

GREEN FODDER / FEED - ALTERNATES

Fodder Trees

Sesbania(Agase), Melia, Neem leaves

Supplementary green with dry fodder-sheep, goat

Sesbania Tree – Drought Resistant

Protein: 17-20%, Good in micronutrients

Moringa Tree leaves

Supplementary fodder, Good protein and micronutrients

Azolla

Azolla as Green Feed Supplement

- Azolla - Good protein source and micronutrients
- Can be grown in backyard with low inputs
- Mix with with maize / bran and feed (Cattle:4-5 kg, sheep/goat:1 kg) – Strategic supplement
- Improves milk quality in dairy animals

"Not a fodder substitute"

Nutritional Composition of Azolla

DM	Ash	AIA	NDF	ADF	Lignin	CP
	.....% DM.....					
4.56	13.3	1.70	51.1	29.5	7.02	21.9
(4.1-8.2)	(10.0-14.1)	(1.1-1.9)	(50.0-56.2)	(26.0-31.1)	(6.5-7.5)	(21.3-25.6)

High Moisture, Good Source of Protein
Mix with grains / bran and feed

Mineral Composition of Azolla (DM basis)

Ca	P	Mg	S	Cu	Zn	Fe	Mn	Co	I	Cr
.....%.....				.....ppm.....						ppb
1.40	1.01	0.74	0.21	22	31	755	130	4.5	32	127

Good Source of Most Minerals

Supplementary green feed

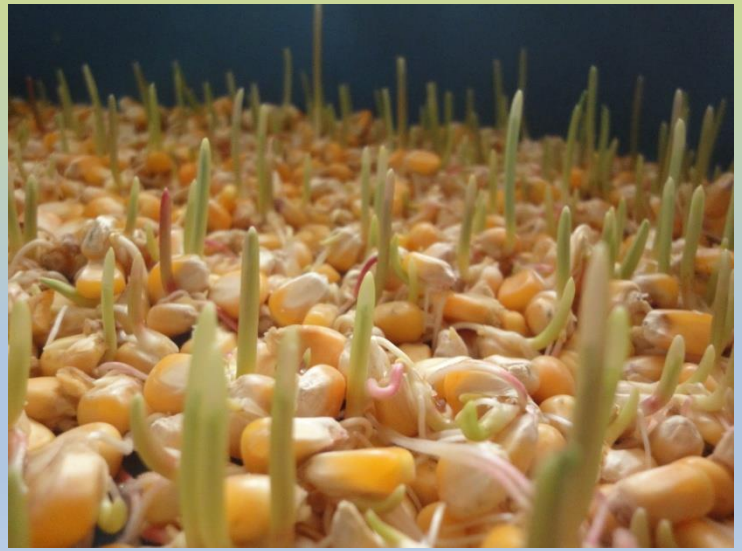
Hydroponic – Grain sprouts as green feed

Day 1

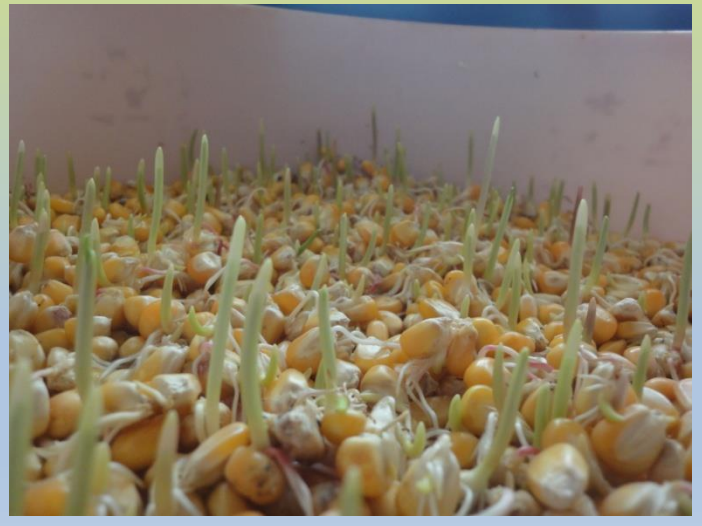
Day 2

Day 3

Hydroponic without chambers for small scale production



Day 4



Day 5

Day 6, 7 cm

Day 7, 10 cm

Day 8, 12 cm

Day 9, 15 cm

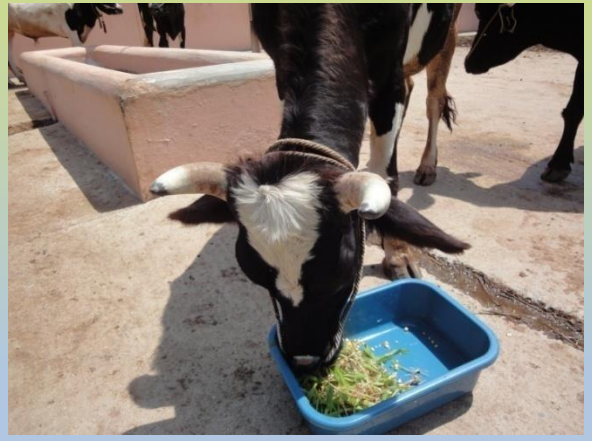
Day 10, 20 cm

Yield 1 kg grain = 4-5 kg green feed, DM 14-16 %

Soaking

Germinating

Sprout fodder



Contingency green feed for livestock

Maize Grain Sprouts

Benefits & Constraints

Quality of seeds, Dry matter loss

Fungal growth, Rodents, Squirrel

Not a substitute for conventional green fodder (Less Fibre content)

Hydroponic Grain sprout – Strategic green supplement along with dry fodder

Better amino acids, vitamins - Improves milk quality – both fat and SNF, Conception rate

"Contingency green feed"

Nutritive value of maize grain sprout

Dry matter -15.0-17.2%

DM basis :

Crude protein - 13.8-15.3%

Ether extract-3.41%, Crude fibre-12.40%

Ash-2.46%, NFE-67.84% ; NDF-32.70%, ADF-17.9%

Ca-0.24% and P-0.40%

ME values : 11 MJ / kg DM (73% TDN)

Grain sprouts may not be a replacement for conventional green fodder.

Sometimes Palatability of grain sprout is a problem.

Nutritive value (CP, CF and NDF) of Grain sprouts – does not match for a conventional green fodder like maize or jowar

The CP, CF and energy values of Grain sprouts (Dry basis) - Similar to better quality cereal by-products like wheat bran (???)

It can be a contingency green feed supplement but not green fodder (strategic supplement) – Good quality green bran

Baby Corn Fodder

Can be used for feeding green fodder

Vegetable, Fruit waste – Market, Marriages, Hotel : Can be Harnessed, Processing required

Crop Residue Management

Bulk of dry matter is crop residues

Limited land and water for green fodder cultivation

Value addition of dry fodder is required

Spray with Urea – Molasses Solution

2 kg Urea, 4 kg Molasses/ Jaggery, 20 lit water per 100 kg straw

Quality Similar to Medium quality green fodder like rhodes grass

Scarcity situations

Fodder conservation

- **Plastic drums are most durable.**
- **Easy to handle**
- **Bare minimum spoilage**
- **Best for small holders.**

PFR silage

Quality Silage : 90% Maize + 10% Sesbania

Feeding silage alone for long period – Rumen acidosis

Silage should be fed along with dry fodder or concentrate mixture in the form of total mixed ration.




Ration Balancing

-Dry fodder

-Green fodder

-Concentrate ingredients or compounded feed

-Supplements (Mineral, Vitamin)


High Yielding Dairy Animals

MILK YIELD

FEED INTAKE

Low fat
SNF

Loss of Body weight

To regain lost body weight in 60 days

Post partum anestrus

1 2 3 4 5 6 7 8 9 10 11

CALVING

MONTHS AFTER CALVING

Bypass fat : Energy supplementation
Bypass protein : Essential amino acid- Quality feeding is required

High yielding cattle

Milk Quality

Ration Balancing is a Challenge

Require Nutrient Dense Diet

Quality green fodder, Legumes (Hay)

Special Concentrate mixture, Supplements

Practical Dairy Concentrate Mixture

Ingredient	(%)
Grains (maize, bajra, sorghum, ragi, wheat)	30-40
Grain by –products (Bran/ polishings, Chunni)	15-30
Urea (Optional)	1
Molasses / Jaggery	5-10
Oil cakes (GNC, SBM, CSC)	25-35
Mineral mixture	2
Common salt	1

Combination of many feeds is good ; 6-7 ingredients in a compounded feed is ideal

Concentrate mixture

Excess intake of concentrate- Low milk fat

Ration balancing with fodder is required

Ration Balancing

NDDB under National Dairy Plan

Ration Balancing not possible

with only dry fodder or only Concentrate mixture xx

1. Green fodder with legumes: 7-8 kg / day √
2. Green fodder with concentrate mixture √
3. Dry fodder with concentrate mixture √
4. Dry fodder, Green fodder and concentrate mixture √ √

Feed Chart for farmers

Feed Assist soft ware for Field Officers

Ration Balancing Tools

@ ICAR – NIANP, Bangalore

“Milk Quality”

Fat – Fibre (Fodder)

SNF – Protein, Energy

Ration Balancing is key

Suggested Ration for Milch Animals

Milk Yield (kg/day)	Dry matter intake (kg/Day)	Concentrate mixture (%)	Fodder	Proportion	
	DM requirement 2% of BW, 0.4 kg DM / kg Milk in cow, 0.6 kg DM / kg milk in buffalo			Green	Dry
5 (low)	7-8	-	100%	100 (40 kg)	-
5 (low)	7-8	-	100%	70 (25 kg)	30(3.5 kg)
8 (Moderate)	9-10	20% (2.3 kg)	80%	60 (30kg)	20(2.4 kg)
12 (Medium)	11-12	35% (4.25 kg)	65%	40 (25 kg)	25 (3 kg)
16 (High)	15-16	50% (8.5 kg)	50%	40 (25 kg)	10 (1.7 kg)
25 (high)	20-21	60% (13 kg)	40 %	30 (25 kg)	10 (2.5 kg)
30 (High)	23-24	65% (15 kg)	35%	25 (25 kg)	10 (2.5 kg)
High yielders	Use buffers, probiotics, yeast, chelated minerals, Bypass fat, protein		Good quality green and legumes, green hay		
		Total Mixed Ration			

Total Mixed Ration – Mix Chaffed Fodder with Concentrate

Better Digestion

Prevent Rumen Acidosis

Fodder First

Concentrate Next

(Practical TMR)

Mastication

Salivation

Rumen fermentation

Subclinical Rumen Acidosis

Low fodder intake – Most common

When fed with more cereal grains or concentrate mixture - rumen acidosis and low milk fat

Prolonged feeding of silage alone as a sole source of fodder - low fat in milk.

Feeding silage alone for long period – Rumen acidosis

Silage should be fed along with dry fodder or concentrate mixture in the form of total mixed ration.

Feeding of sodium bicarbonate (50-60gm/day) is also helpful

Low Milk Fat Conditions

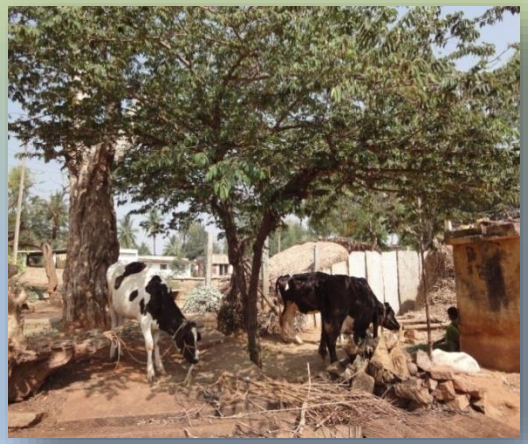
Rumen buffers, such as Sodium bicarbonate ($NaHCO_3$: 50-60 gm per day) and Magnesium oxide (MgO : 10-15 gm per day) will be helpful.

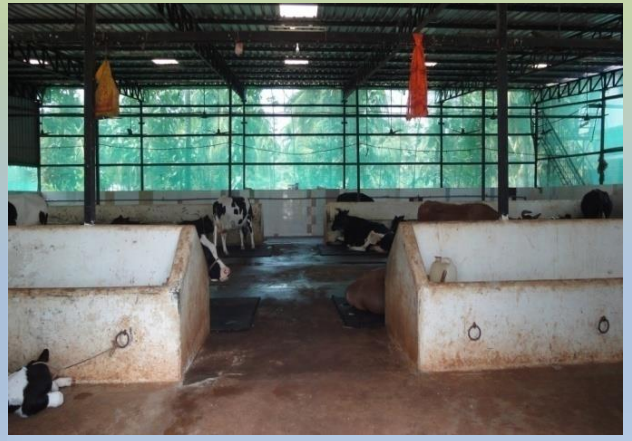
Magnesium Oxide (MgO) supplementation increases triglyceride uptake by the mammary gland.

Feeding MgO tends to increase lipoprotein lipase activity in the mammary gland.

Summer Stress

X





√ **Feed during cooler Hours – Early Morning and Late Evening**

V Managemental factors

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Do not mix concentrate feed with water

√

Just sprinkle water

Do not soak for long time – Fermentation – Sour (Acidic pH)

After feeding concentrate mixture, avoid giving drinking water for at least 2 hours, so that feed remains in rumen for fermentation.

Complete milking to be done - Last drops of milk from udder has more fat

THANK YOU