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Practical Nutrition

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Practical Nutrition



- The Cow
- Rationing
- The Forages
- The Concentrates

The Cow

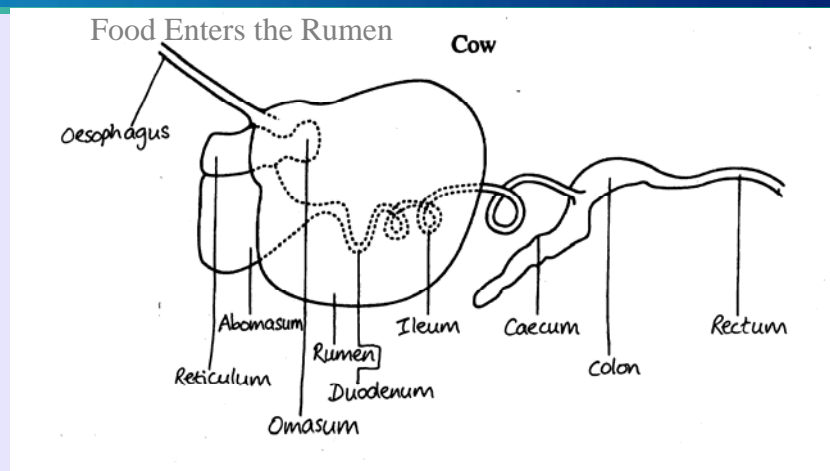


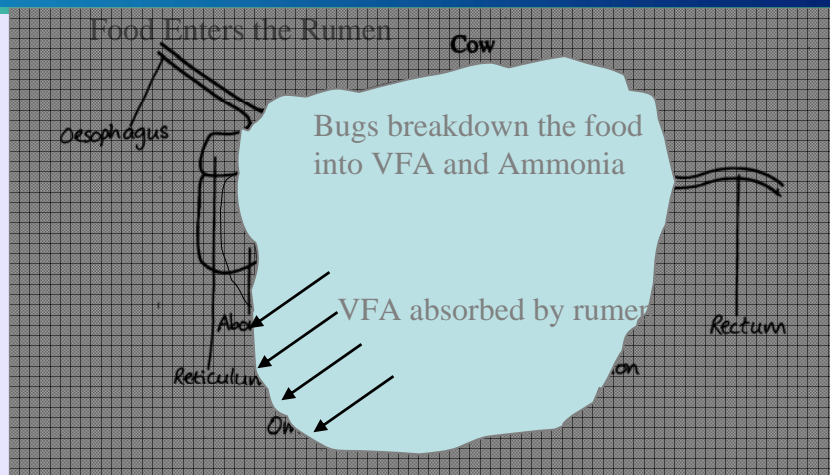
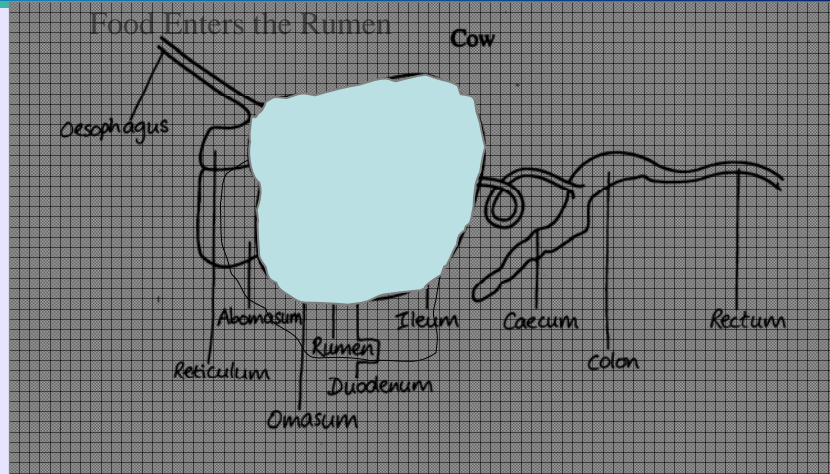
- Rumen Function
- Energy Requirements
- Body weight and Cow Condition

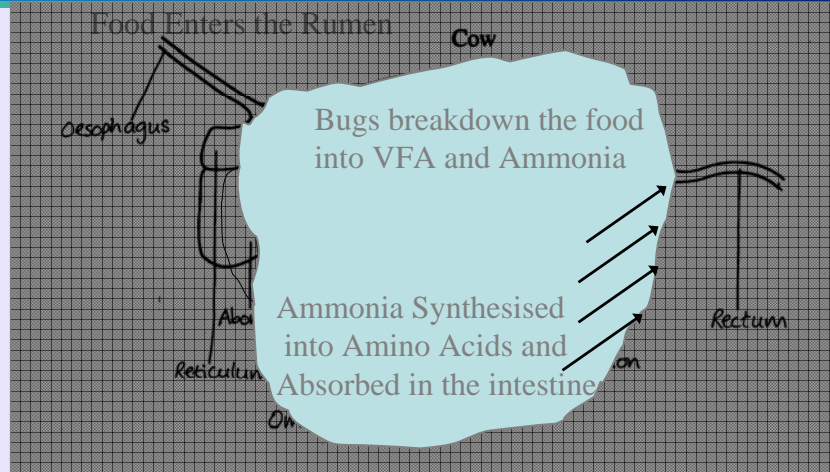
Rumen Function



- Large fermentation vat
- Food enters the rumen
- Fermented by bugs
- Produces VFA and ammonia







Rumen Function

- Bugs require energy to thrive
- Use carbohydrate as energy source
- Breakdown carbohydrate to VFA
- Breakdown proteins to ammonia

Volatile Fatty Acids



- Propionic / Acetic / Butyric
- Absorbed by the rumen
- Provide 70% of animals energy requirements
- Other 30% absorbed in the small intestine

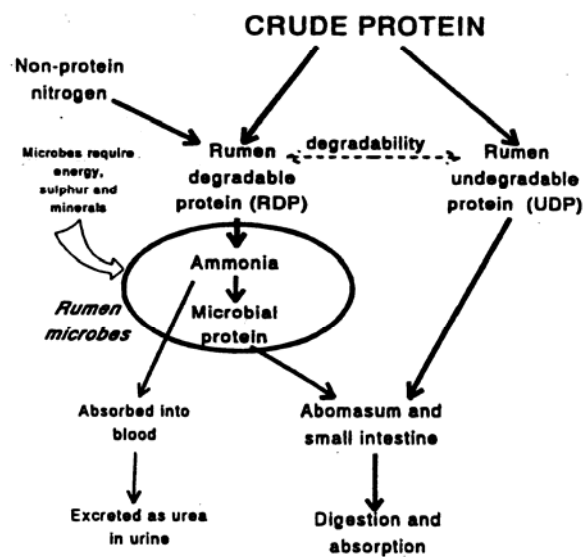
Volatile Fatty Acids



- High forage diets promote Acetic acid production leading to high butterfat
- High Starch diets promote Propionic acid production leading to high protein

- Rumen Degradable Protein broken down in rumen by bugs to Ammonia
- Synthesised into amino acids and absorbed in intestine
- Surplus protein absorbed by blood and processed by liver
- Excreted as urea
- Energy is required for excretion

Figure 6.1 Digestion of protein in the ruminant



Animal Requirements



Depends on

- Breed
- Genetic potential
- Desired output
- Cow Condition
- Pregnancy status
- Economics?!

Energy Requirements



- Maintenance
- Milk Production
- Body weight Change
- Pregnancy

Maintenance



- 10% of Body weight + 10MJ
- e.g.
- 650kg holstein cow
- $65 + 10 = 75$ MJ energy for maintenance
- 450kg Jersey
- $45 + 10 = 55$ MJ energy for maintenance

Milk Production



- 5.3 MJ per litre
- Depends on Milk Quality
- 3.7% fat and 3.1% protein
 - 5.1MJ
 - 30 litres 153MJ
- 6% fat and 4% protein
 - 6.8MJ
 - 30 litres 204MJ
- Difference equivalent to 4kg concentrate

Body Weight Change



- 1kg of weight loss
- 28MJ energy released
- 1kg of weight gained
- 34 MJ energy required

- 1 Body condition score = 10% body weight

Pregnancy



- Total required throughout Pregnancy
- 2000MJ
- Early months
- 5MJ per day
- Pre calving
- 37MJ per day

Rationing



The ration must be balanced based on:

- Forages available
- Other Feeds available
- Other Feeds required

Target composition of whole ration



	High yield	Average yield
Forage proportion (%DM)	35-45	> 40
DM content (g/kg)	450- 600	>350
CP (g/kg DM)	170- 190	160-180
ME (MJ/kg DM)	>12	11.5-12

	High yield	Average yield
Starch	150-200	120-170
Sugar	50-100	40-80
Starch + sugar	220-270	150-200
Oil	40-60	30-50
NDF	320-360	360-420
NDF from long forage	240-270	270-320

Balancing the Ration

- Estimate silage intake
- 10-14 kg DM per day
- Kg DM X ME
- Total Energy from Forage
- Require 65-70MJ for Maintenance
- Require 5.25 MJ per litre of milk

Silage Intakes



- 650kg Holstein - 20kg DM
- 50-60% forage
- 10-12 kg DM of forage
- 25 - 70kg fresh weight

Silage Value



Maintenance plus Litres of milk

	Silage ME MJ/kg DM			
Intake Factor	9.5	10.0	10.5	11.0
80	M + 0.8	M + 2.0	M + 3.5	M + 5.0
90	M + 1.0	M + 2.5	M + 4.5	M + 6.0
100	M + 1.25	M + 3.25	M + 5.5	M + 8.0

Balancing the Ration



- Calculate availability of other Forages
- Calculate availability of other Feeds

Balancing the Ration



- Calculate energy requirement
- Energy sources
- Combination of Starch, sugar and oil

Balancing the Ration



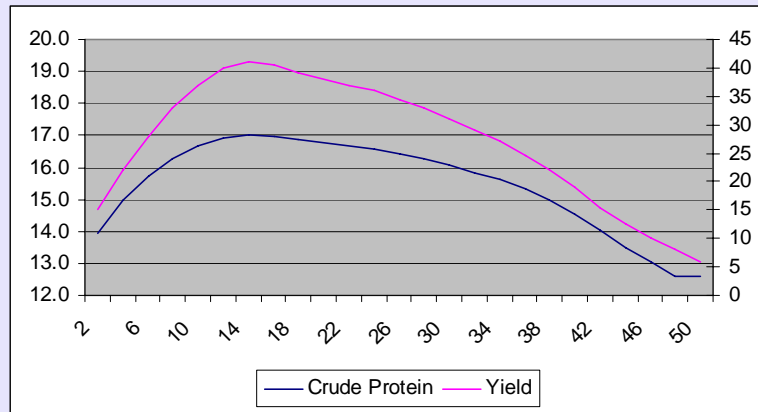
- Calculate Protein Requirements
- Protein sources
- Combination of RDP and UDP

Balancing the Ration

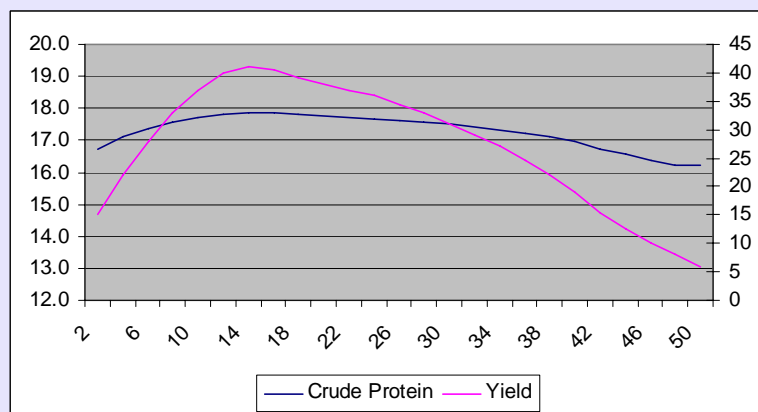


- Protein
- High UDP -
 - Encourages milk production
 - Mobilises fat
 - Reduces body condition
- Beware of balance through lactation

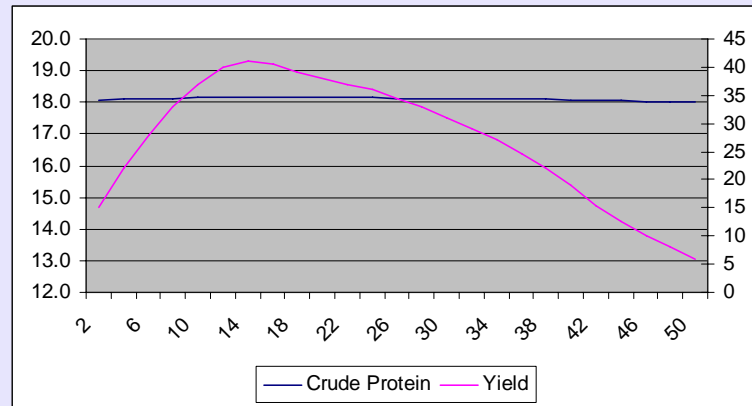
12% Silage plus 22% Cake



16% TMR plus 18% Cake



18% TMR Plus 16% Cake



Feed Types Quality and Uses Forages

Forages



- Grass Silage
- Alternative Forages

Grass Silages



- Ideal Silage Quality
- 2007 Analysis

Ideal Analysis



- Dry matter 25-30%
- ME 11 - 12 MJ/kg DM
- Crude protein 14 - 18 %
- FME/ME 0.66-0.70
- Intake Factor 100+
- Ammonia < 8%

2007 Analysis



- Dry matter 17-30%
- ME 10.0-11.5 MJ/kg DM
- Crude protein 11 - 15 %
- FME/ME 0.66-0.70
- Intake Factor 80 - 110
- Ammonia 5 - 10%

- Forage low dry matter
- Forages low in energy
- Bugs in rumen lack energy to thrive
- Poor breakdown of forages
- Can cause a protein imbalance
- Require energy to excrete surplus protein
- Low milk production

Silage Quality

	Silage A	Silage B	Silage C	Silage D
Dry Matter	25%	25%	25%	25%
ME	10.7	10.7	11.5	11.5
CP	135	135	135	135
Intake Factor	89	105	89	105
Fermentation	Poor	Good	Poor	Good

Silage Quality



	Silage A	Silage B	Silage C	Silage D
Silage Intake	37kg	40kg	41kg	47kg
Silage DMI	9.1	9.9	10.2	11.8kg
Cake	11.7	10.9	9.8	8.2
For 30 litres				
Cost (ppl)	7.0	6.6	5.9	4.9



Alternative Forages

- Why use alternative forages?

Why?

- Maximise DM intake
- Reduce concentrate amount/cost
- Produce bulk
- Produce cheap protein
- Produce starch

Why?



- Spread risk
- ~~Gain AAPS on forage~~
- ~~Curiosity~~

Dry Matter Yields (Bulk)



Crop	Yield tDM/ha
WCW Urea	15
Red Clover	13
WCW Fermented	12
Maize	10
Grass Silage	10
Forage Peas	8
Kale	7

Cost of Production



Crop	Cost/tDM
WCW Urea	50
Red Clover	60
WCW Fermented	55
Maize	50
Grass Silage	65?
Forage Peas	60
Kale	55

Starch



Crop	g/kg DM
WCW Urea	250-350
Red Clover	0
WCW Fermented	150-300
Maize	200-300
Grass Silage	0
Forage Peas	0-150
Kale	0

Protein



Crop	g/kg DM
WCW Urea	150-250
Red Clover	170
WCW Fermented	100
Maize	80-100
Grass Silage	100-190
Forage Peas	140-180
Kale	170

Urea Whole Crop / Alkalage



Advantages

- High pH
- Stable product
- High protein
- High starch / Mature crop
- Arable aid

Disadvantages

- Safety
- Best with wheat
- Specialist machinery



Fermented Whole Crop



Advantages

- Barley or Wheat
- Reliable source of bulk
- Uses existing machinery
- Arable aid

Disadvantages

- Relatively low feed value
- Difficult to achieve good fermentation



Forage Maize



Advantages

- Good buffer feed
- Arable aid (currently)

Disadvantages

- Limited growing area
- Harvested late



Red Clover



Advantages

- High protein silage

Disadvantages

- Difficult to ensile
- lower yield in establishment year



Kale

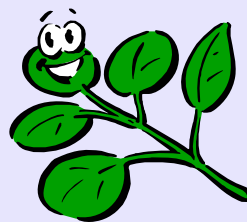


Advantages

- Good protein source
- Can use as catch crop
- Can be big baled

Disadvantages

- Difficult to feed
- Expensive
- No arable aid



Forage Peas

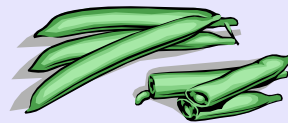


Advantages

- High protein
- Leguminous
- Arable Aid?
- Cheap with current arable aid?

Disadvantages

- Lower DM yields
- Difficult establishment



Lupin Wholecrop



Advantages

- High protein
- Leguminous
- Arable Aid?
- Cheap with current arable aid?

Disadvantages

- Lower DM yields

Growing Experience



- Existing arable experience
- Existing grassland policy
- Reseeding policy
- Reliability of grass growth

Feeding Experience



- Additional bulk
- Enhanced intake?
- Higher dry matter in total diet
- Quality and quantity of grass silage
- Quality of alternative forage
- Yield level per cow

Other Considerations



- Harvesting
- Storage
- Feeding

Fermented Whole Crop



- Typical analysis
 - DM 350 - 500 g/kg
 - ME 10.0 - 11.0 MJ/kg
 - CP 100 g/kg
 - Starch 100-300 g/kg DM
- Yield 12 t/ha
- Cost £55 per tonne DM



Forage Maize



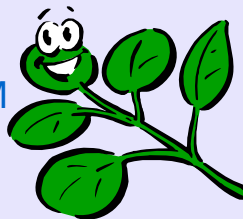
- Typical analysis
 - DM 250 - 320 g/kg
 - ME 10.5 - 11.5 MJ/kg DM
 - CP 80 - 100
 - Starch 220 - 300
- Yield 12 t DM/ha
- Cost £50 per tonne DM



Kale



- Typical analysis
 - DM 200 g/kg
 - ME 12 MJ/kg DM
 - CP 170 g/kg
 - Starch 0
- Yield 7 t/ha
- Cost £55 per tonne DM



Red Clover



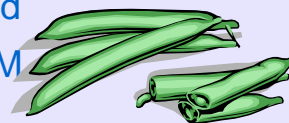
- Typical analysis
 - DM 230 g/kg wilted
 - ME 10.5 MJ/kg DM
 - CP 170 g/kg
 - Starch 0
- Yield 13 t/ha (2 cuts)
(less in establishment year)
- Cost £45 per tonne DM



Forage Peas



- Typical analysis
 - DM 250 g/kg wilted
 - ME 10.5 MJ/kg DM
 - CP 180 g/kg
 - Starch 0
- Yield 8 t/ha
- Cost £45 per tonne DM



Feed Types Quality and Uses Concentrates

Concentrates

- Energy

Starch	Dry Matter	ME	Crude Protein	Starch
Wheat	85%	13.6	12%	75%
Barley	85%	13.2	12%	57%
Oats	85%	12.0	9%	50%
Potatoes	20%	13.3	9%	57%
Wheatfeed	88%	11.3	19%	24%
Maize Gluten	88%	12.9	22%	20%

Concentrates



- Energy

Sugar	Dry Matter	ME	Crude Protein	Sugar
Molasses	72%	12.2	10%	40%
Sugar Beet Pulp	89%	12.5	11%	28%
Citrus Pulp	82%	12.6	7%	25%
Fodder Beet	18%	12.0	6%	66%
Carrots	13%	12.8	10%	60%

Concentrates



Protein	Dry Matter	ME	Crude Protein	Deg
Ground Nut	90%	13.2	53%	70%
Soya Bean	90%	13.4	51%	65%
Rapeseed	90%	12.0	40%	75%
Cotton seed	92%	11.3	36%	65%
Linseed	90%	11.9	40%	65%
Beans	85%	13.3	30%	85%
Peas	87%	13.5	26%	80%
Lupins	87%?	13.4	37%	80%

Concentrates



Energy / Protein	Dry Matter	ME	Crude Protein
Wheat Distillers' Dark Grains	90%	13.5	34%
Maize Distillers' Dark Grains	89%	14.0	32%
Barley Distillers' Dark Grains	89%	12.2	27%
Maize Germ	88%	14.0	25%
Maize Gluten	88%	12.9	22%
Malt Culms	90%	11.2	28%
Wheatfeed	88%	11.3	19%
Oatfeed	86%	5.6	5%

Concentrates



Other	Dry Matter	ME	Crude Protein
Sopralin	90%	12.9	50%
Raptec	90%	15.0	40%
Regumaize	69%	11.8	64%
Megalac	90%	29.0	0%

Alternative Feeds



- Brewers' & Distillers' By Products
- Vegetables
- Bakery By Products

Alternative Feeds



- Determine value to your ration
- Dry Matter
- Feed Value
- Supply
- Storage
- Feeding

Brewer's Products



	Dry Matter	ME	Crude Protein
Brewers' Grains	24%	11.5	25%
Supergrains	26%	13.0	32%
Vitagold	35%	14.0	35%

Brewer's Products



Advantages

- No land area required
- Can buy as required or store on farm
- No special machinery required
- Protein Supply

Disadvantages

- More expensive per tonne of dry matter
- High Oil

Vegetables



- Fodder Beet
- Carrots
- Potatoes
- Peas
- Green Veg

Vegetables



- Root Veg
 - Low Dry Matter
 - Good Energy Supply
 - Low Protein
- Green Veg
 - Low Dry matter
 - Good Energy and Protein

Vegetables



- Disadvantages
 - Supply
 - Storage
 - Taints!
 - (Onions, Leeks, Brassica)

Bakery By Products



- Biscuit Meal
- Sweet Meal
- Bread
- Breakfast Cereal

Bakery By Products



Advantages

- High Energy
- High Starch

Disadvantages

- Acidosis
- Storage

How Much to Feed?



- Most alternative feeds can be fed safely at 2kg of dry matter
- Ensure ration is balanced!
- Ensure they complement your other feeds

Summary



- Evaluate Forages
- Evaluate Ration
- Have realistic expectations
- Change ration to feed rumen



Young Stock Rearing

Aim



Calf and Young Stock Rearing



- Why?
- Heifers Most Important Stock
- High Replacement Rates



Remember.....



- Aims:
- To produce a healthy heifer to calf into the dairy herd in the most cost effective way
- Highest genetic merit animals in the herd
- Maximise opportunities for planned breeding strategies
- Optimise heifer life expectancy!

Dairy Heifers



- DAISY recorded herd survey
Kossaibati and Esslemont (1999)
- 22% of replacement heifers born die before they reach their first lactation
- Further 14% culled during their first lactation
- 31 heifers required / 100 cows for the average 24% replacement rate.
- = potential shortage of heifers!
- = limited culling opportunities for main herd

Main reasons for culling / death



- Rearing stage
 - No reason 39%
 - Infertility 19%
 - Poor growth 19%
 - Health problems (scour / pneumonia) 6%
 - Injury / accident 5%
 - Freemartin 1%
 - No records 11%
- First Lactation
 - Fertility problems 43%
 - No reason 25%
 - Poor milk yield 10%
 - Disease 8%
 - Management 7%
 - Injury / accident 5%
 - Other 2%

Calf Rearing



- Housing
- Bedding
- Milk
- Solid Feed
- Disease



Housing



- Wherever is free
- Traditional Buildings
- Cramped
- Poor Ventilation

- Quite Normal!!!!

Housing



- Clean
- Dry
- Well Ventilated but not drafty
- Own Air Space
- Plenty of room

- Ideal!!

Housing



- Totally enclosed forced ventilation
- Purpose built traditional ventilation
- Hutches
- Outside

- Ability to rest a site

Housing



- Individual pen vs group vs hutch
- Welfare codes (individual penning up to 8 weeks and no complete enclosure)
- Ability to create all in all out systems important.
- Multiple sites (+/- hutches) can help
- Bucket vs teat vs automatic (ad lib vs controlled)

Housing - Ventilation



- Ventilation critical, particularly with low body weights and heat generation
- Building must be well ventilated
- But not drafty
- Beware of air from other stock

Bedding



- BASIC!!!
- Clean
- Dry
- Replaced

Nutrition, calf starter feed



- Pellets vs coarse mix
- Home mixes
- High cereal inclusion rates
- High starch levels
- Rapid rumen fermentation, acidosis, chronic indigestion.
- Relative excess of RDP
- Feed quality, encourage intakes

Weaning management



- From 5-6 weeks depending on size
- Set minimum criteria required
- Target 65kg
- Food intakes
- >0.75kg calf starter feed per day (measure it).
- Abrupt weaning, lowest solid food intakes
- Increase solid food intake by 50%, could lead to digestive upsets

A Well Cared for Calf



- Weaned 6 - 8 Weeks
- Healthy
- No previous Disease
- Good Solid Feed intake
- Good Conformation
- No pot belly and rough hair



What Next!?

Heifer Rearing



- The growing heifer
- Growth rates
- Nutrition
- Systems

Heifer Rearing



- Aims:
- To produce a healthy heifer to calf into the dairy herd!
- At what age?
- At what weight?

Heifer Rearing



When should you calf heifers

- When they are big enough!
- When they are old enough!
- When they fit the calving pattern

Heifer Rearing



• Age at calving	Age at bulling
• 24 months	15 months
• 27 months	18 months
• 30 months	21 months
• 33 months	24 months

Heifer Rearing



- Weight at Bulling?
- Depends on breed
- 320 - 400kg for Holstein Friesian
- 250 - 280kg for Jersey
- Size Matters!!

Heifer Rearing - Birth to Bulling



- Target Growth Rates

	Weight at bulling			
• Age at bulling	330kg	345kg	365kg	380kg
• 15 mth	0.64 kg	0.68 kg	0.72 kg	0.75 kg
• 18 mth	0.54 kg	0.56 kg	0.60 kg	0.63 kg
• 21 mth	0.46 kg	0.48 kg	0.52 kg	0.54 kg
• 24 mth	0.40 kg	0.42 kg	0.45 kg	0.47 kg

Breeding Objectives



- Improve Genetics
- Easy Management
- Get her in calf!

Breeding Objectives



- Synchronised AI
- Natural AI
- Sexed Semen
- Dairy Bull
- Beef Bull

Synchronised AI



- Good for Block Calving
- Extra Cost
- Variable Conception Rates

Natural AI



- Observation
- Conception Rates

Sexed Semen



- Reduced number of dairy pregnancies
- Additional value in beef calves
- Reduced Selection of Bulls
- Conception Rates?

Dairy Bulls



- Variable genetics
- Good conception rates
- Need to manage calving period

Beef Bull



- Easy Option!!!

Heifer Rearing



- Weight at Calving?
- Cow competition
- Management post calving
- 85% of mature cow weight?
- 550kg for 650 kg herd
- 475kg for 550kg herd
- 400kg for 450kg herd

Heifer Rearing - Bulling to Calving



- Weight at bulling

• Wt at calving	330kg	345kg	365kg	380kg
• 575 kg	0.87 kg	0.81 kg	0.74 kg	0.69 kg
• 550 kg	0.78 kg	0.72 kg	0.65 kg	0.60 kg
• 525 kg	0.69 kg	0.64 kg	0.56 kg	0.51 kg
• 500 kg	0.60 kg	0.55 kg	0.48 kg	0.42 kg

Heifer Rearing - Nutrition



- Target Growth Rates
- Forages
- Concentrates
- Alternatives

Heifer Rearing - Nutrition



- Maintenance
- = 10% of Body Weight + 10 MJ

Body Weight	Maintenance	Body Weight	Maintenance
Kg	MJ	Kg	MJ
100	20	350	45
150	25	400	50
200	30	450	55
250	35	500	60
300	40	550	65

Heifer Rearing - Nutrition



- Target Growth Rates
- 1.0 kg live weight gain per day
- 2 times Maintenance

Body Weight	Weight Gain	Body Weight	Weight Gain
Kg	MJ	Kg	MJ
100	20	350	45
150	25	400	50
200	30	450	55
250	35	500	60
300	40	550	65

Heifer Rearing - Nutrition



- Forages:
- Silage
- Hay
- Straw

Heifer Rearing - Nutrition



- Silage Quality
- Silage Alone
- Silage Plus....
- Energy Requirements
- Protein content

Silage Quality



- What silage do heifers get?
- Which Cut?
- Which Silage?
 - Top and Shoulders of pit
- Dry Matter
- ME
- Protein
- Intake Factor

Silage Quality



- Many heifers get silage only for winter diet
- What is silage alone worth?
- Does silage alone give a balanced ration?

Growth Rates for 350kg Heifer

Intake Factor	Silage ME MJ/kg DM			
	9.5	10.0	10.5	11.0
80	0.0kg	0.15kg	0.30kg	0.45kg
90	0.10kg	0.20kg	0.35kg	0.50kg
100	0.25kg	0.35kg	0.45kg	0.55kg

Target 0.7kg per day!

- 350kg bulling heifer
- Target 0.7 kg per day

Heifer Rearing - Example Diets



Feed	Quantity	Cost per tonne
Silage (good)	25kg	£20
Concentrate	0.5kg	£180
Cost per day		59p

Silage:
 Dry Matter 25%
 ME 11.5
 Protein 12%
 Intake Factor 100%

Concentrate:
 Dry Matter 88%
 ME 13.5
 Protein 40%

Heifer Rearing - Example Diets



Feed	Quantity	Cost per tonne
Silage (av)	20kg	£20
Concentrate	2kg	£165
Cost per day		73p

Silage:
 Dry Matter 25%
 ME 10.5
 Protein 12%
 Intake Factor 90%

Concentrate:
 Dry Matter 88%
 ME 12.5
 Protein 19%

Heifer Rearing - Example Diets



Feed	Quantity	Cost per tonne
Silage (poor)	17kg	£20
Concentrate	3kg	£165
Cost per day		83p

Silage:
 Dry Matter 25%
 ME 9.5
 Protein 12%
 Intake Factor 85%

Concentrate:
 Dry Matter 88%
 ME 12.5
 Protein 17%

Heifer Rearing - Example Diets



Feed	Quantity	Cost per tonne
Straw	4kg	£60
Concentrate	4kg	£165
Cost per day		90p

Concentrate:
 Dry Matter 88%
 ME 12.5
 Protein 170%

Heifer Rearing - Example Diets



Feed	Quantity	Cost per tonne
Straw	4kg	£60
Supergrains	6kg	£40
Sugar Beet	2.5kg	£150
Cost per day		74p

Protein



- Total Protein in the Diet - 16%
- Balance the forage
- Good quality protein
- Promotes lean muscle and bone growth
- Promotes udder development
- Avoids excessive fat deposition

Young Stock



- Determine Target
- Check Forage
- Supplement correctly

Costs of Heifer Rearing



- Flying Herd - Buy at point of calving
- Breed your own

Flying Herd



- Cost - £850 - £1000
- Limited History
- Disease Issues
- No rearing resources
 - Housing
 - Land
 - Labour
- Value of Beef Calf

Breed your Own



- Known Genetics
- Known Disease Status
- Rearing Resources Required
- Carry Losses
- Low value in male calf

Calf And Heifer Rearing



- Most important animals on the farm
- Set targets
- Know your objectives
- Spend time managing them!

