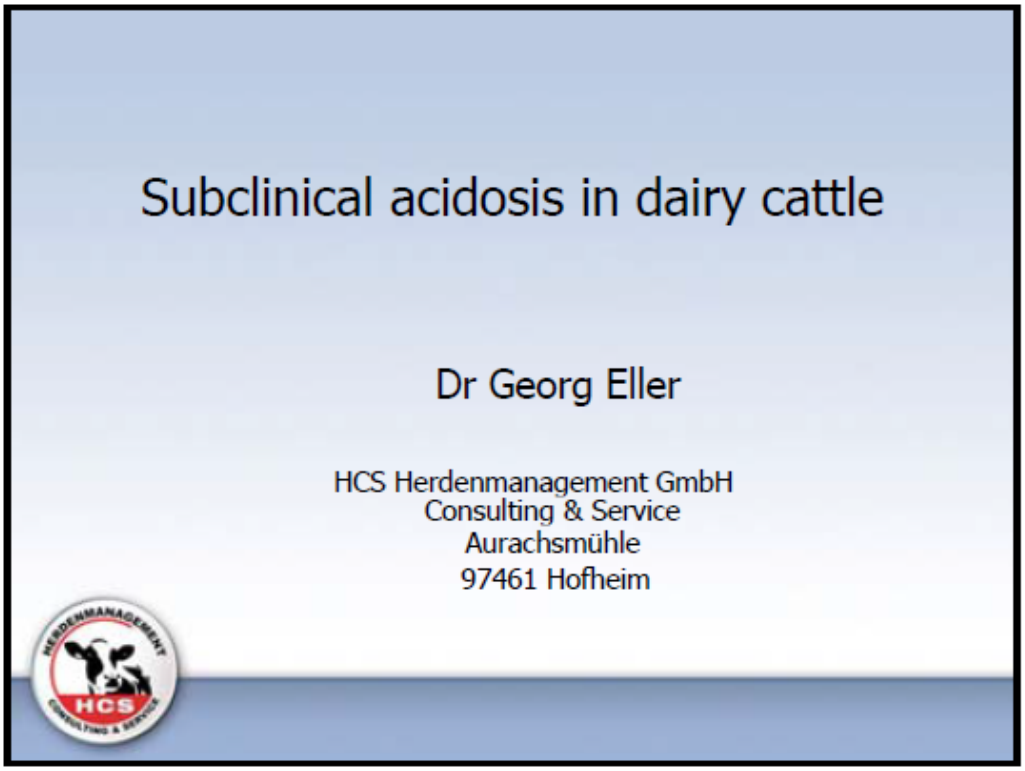
Georg Eller

Dr. Georg Eller received his veterinary license in 1987. From 1987 to 1991 he worked as an assistant veterinarian with Dr. Frohnapfel, Karlstadt and Dr. Hahn, Saal and in 1991 he received his Dr. med. vet. degree. He established his veterinary practice in Hofheim in 1991 which transformed into “Veterinary Clinic Dr. Eller” in 1994. In 2000 he co-founded HCS Herdenmanagement GmbH Consulting Service, an independent agency for dairy farm veterinary advice.



Georg Eller - Subclinical acidosis in dairy cattle

Subclinical acidosis in dairy cattle

Dr Georg Eller

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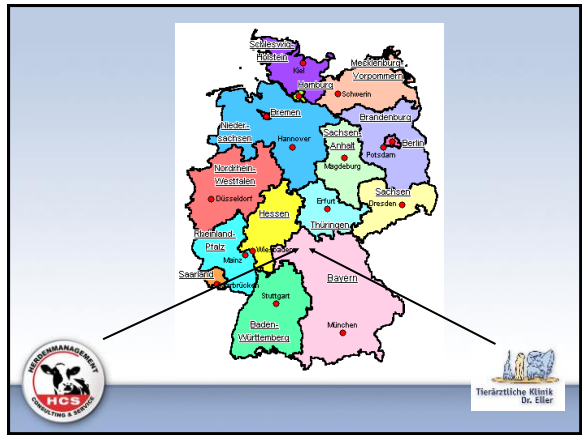
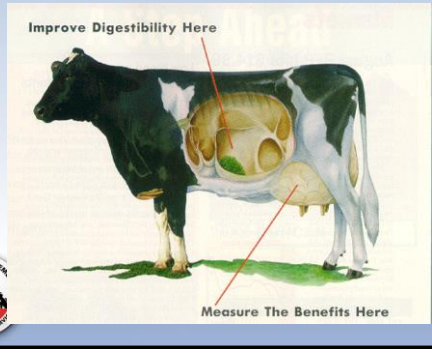


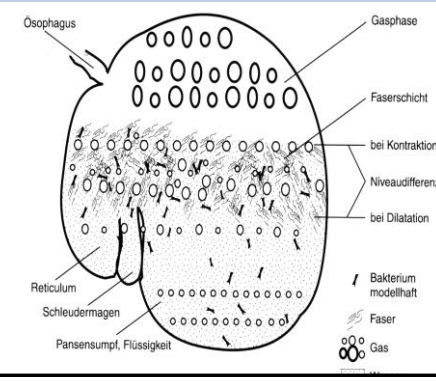
Feeding dairy cows : Feeding bugs



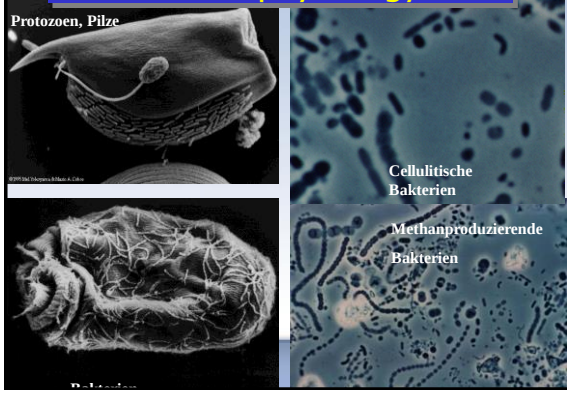
Rumen physiology

Regelgrößen:
pH-Wert
Osmolalität
Temperatur
DM-Chymus
Bicarbonat
Natrium
Kalium
FFS

Leistungen:
- Speicherung
- Mischung
- Separierung
- Absorption
- Abbau
- Synthese
- Transport



Rumen physiology



Subclinical acidosis

- symptoms:
  reduction in DMI
  mild diarrhea
  poor body condition
  laminitis,
  poor therapeutic response
  high culling rates

Georg Eller - Subclinical acidosis in dairy cattle

Risk factors SARA

- **low buffer capacity of less rumen fill**
- **high fermentable ration**
- **low amount of forage NDF**
- **overcrowding**
- **poor cow comfort**
- **heat stress**

Factors influencing rumen health

DMI

Management | feed | animal

Factors influencing rumen health

DMI

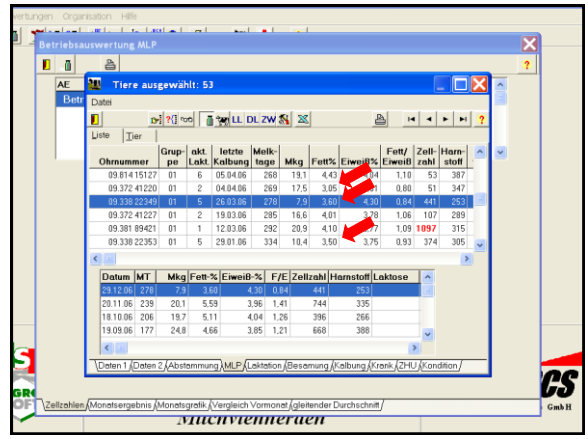
animal

Susceptibility to ruminal acidosis varies among cows

- **Dry matter intake, meal size**
- **Surface area for VFA absorption**
- **Rumen size**
- **Papillae adaptation**
- **Parakeratosis**
- **Rumen motility**
- **Metabolism of absorbed fermentation acids**

Consequences

- **Reduced efficiency of production**
- **Fiber digestion reduced (reduces energy intake)**
- **Appetite depressed (reduces energy intake)**
- **Milk fat concentration depressed (reduces milk energy output, value)**
- **Rumenitis**
- **Reduced absorptive capacity**
- **Liver abscesses**
- **Diarrhea**
- **Laminitis**



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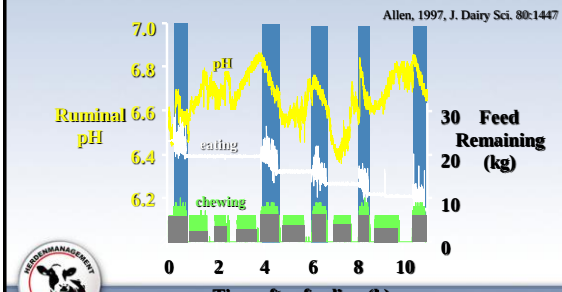
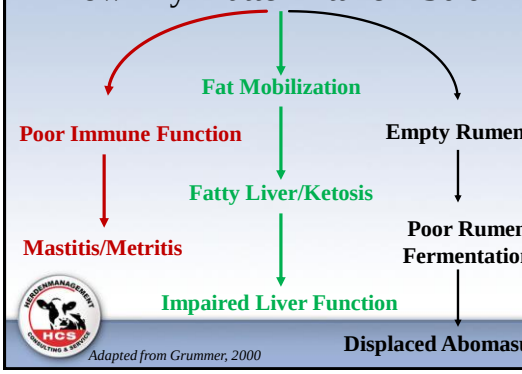
Eating, ruminating, and ruminal pH

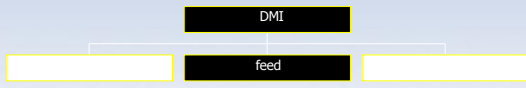


Low Dry Matter Intake < 30 dim



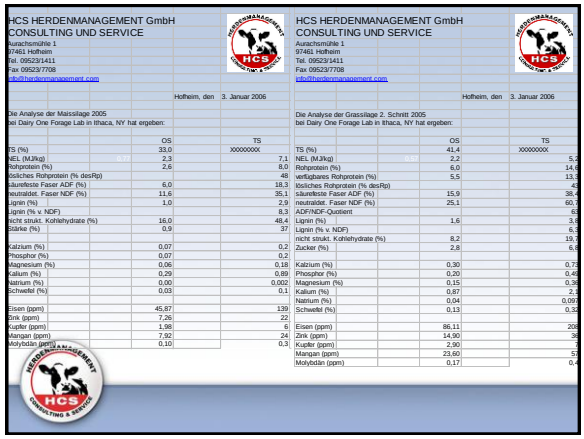
Adapted from Grummer, 2000

Factors influencing rumen health



Feed analyseis

- **Feed analysis is:**
  - **crucial for ration formulation**
  - **necessary for solving problems**
- **Reliable results means:**
  - **representative samples**
  - **Different pieces from various spots at the bunker face**
    - **Correct handling of samples**
- **Which lab to use?**
  - **criteria:**
    - **How fast and how reliable is the lab?**
    - **Costs?**
    - **Wet chemistry or NIRS?**



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Hofheim, den 3. Januar 2006

Die Analyse der Maissilage 2005
bei Dairy One Forage Lab in Ithaca, NY hat ergeben:

	OS	TS
TS (%)	33,0	XXXXXXXX
NEL (MJ/kg)	2,3	7,1
Rohprotein (%)	2,6	8,0
löslches Rohprotein (% desRp)		48
säurefeste Faser ADF (%)	6,0	18,3
neutraldet. Faser NDF (%)	11,6	35,1
Lignin (%)	1,0	2,9
Lignin (% v. NDF)		8,3
nicht strukt. Kohlehydrate (%)	16,0	48,4
Stärke (%)	0,9	37
Kalzium (%)	0,07	0,2
Phosphor (%)	0,07	0,2
Magnesium (%)	0,06	0,18
Kalium (%)	0,29	0,89
Natrium (%)	0,00	0,002
Schwefel (%)	0,03	0,1
Eisen (ppm)	45,87	139
Zink (ppm)	7,26	22
Kupfer (ppm)	1,98	6
Mangan (ppm)	7,92	24
Molybdän (ppm)	0,10	0,3

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Hofheim, den 3. Januar 2006

Die Analyse der Grassilage 2. Schnitt 2005
bei Dairy One Forage Lab in Ithaca, NY hat ergeben:

	OS	TS
TS (%)	41,4	XXXXXXXX
NEL (MJ/kg)	2,2	5,3
Rohprotein (%)	6,0	14,5
verfügbares Rohprotein (%)	5,5	13,3
löslches Rohprotein (% desRp)		43
säurefeste Faser ADF (%)	15,9	38,4
neutraldet. Faser NDF (%)	25,1	60,7
ADF/NDF-Quotient		63
Lignin (%)	1,6	3,9
Lignin (% v. NDF)		6,3
nicht strukt. Kohlehydrate (%)	8,2	19,8
Zucker (%)	2,8	6,8
Kalzium (%)	0,30	0,73
Phosphor (%)	0,20	0,48
Magnesium (%)	0,15	0,36
Kalium (%)	0,87	2,1
Natrium (%)	0,04	0,097
Schwefel (%)	0,13	0,32
Eisen (ppm)	86,11	208
Zink (ppm)	14,90	36
Kupfer (ppm)	2,90	7
Mangan (ppm)	23,60	57
Molybdän (ppm)	0,17	0,4

Goal of formulating diets for high producing dairy cows

- Provide low-fill, highly fermentable diets
- Maintain adequate ruminal pH
- Consistent fermentation over time

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Forages provide coarse fiber

- Dilute starch
- Buffering: chewing, cation exchange
- Selective retention vs. fill
- More consistent supply of absorbed fuels

Rumen "mat"

- Entraps small feed particles
- Increases digesta mass
- Related to increased rumen movements, rumination
  - Rumen movements increase VFA absorption
  - Rumination increases salivary buffers
- Increases "baseline" of absorbed fuels

Feed intake affected by

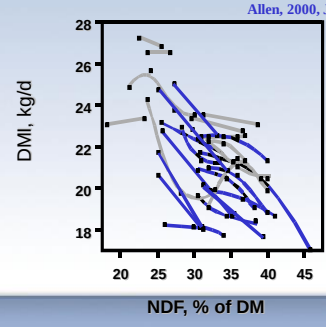
- Filling effect of diets (NDF)
- Ruminal fermentability of diets (propionate)

Dietary factors affecting ruminal fill

- Forage NDF content of diet
- Forage particle size
- Non-forage fiber sources
- NDF digestibility (feed, rumen environment)

Feed intake decreases with increasing NDF content of basal ration

Allen, 2000, J. Dairy Sci. 83:1598



Variation of NDF-content in forage

	Average	± 2 Stdev.
Alfalfa hay (n = 4697)	41.2	28.2 - 54.2
Alfalfa silage (n = 5017)	45.0	32.6 - 57.4
Grass hay (n = 3343)	64.8	50.6 - 79
Grass silage (n = 2508)	59.4	43.6 - 75.2
Corn silage (n = 17358)	46.0	33.4 - 58.6

Source: Northeast DHIA Forage Lab, Ithaca, NY 1995

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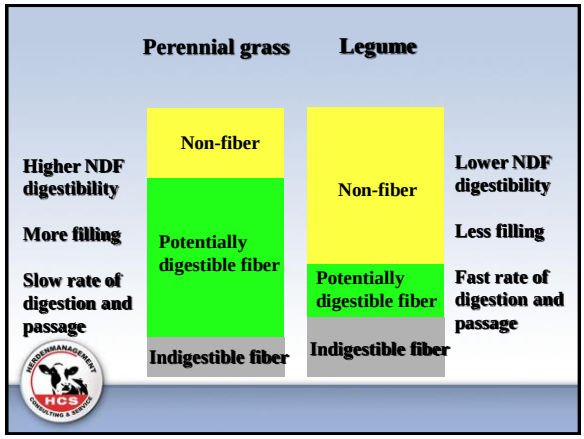


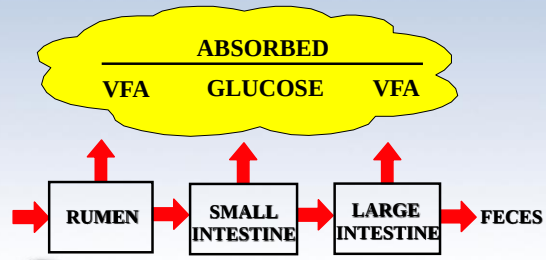
NDF digestibility

- NDF digestibility is an important parameter of forage quality.
- Forage NDF digestibility is extremely variable.
- Forages with high NDF digestibility have the potential to increase energy intake and milk yield.
- Benefits are greater for high-producing cows and cows fed high forage diets.
- NDF digestibility can be estimated by lignin content

variation of starch digestibility

- **Type of grain**
- **Moisture content**
- **Ensiled?**
- **Time of harvesting**
- **Fine or coarse**
- **Endosperm type**

Sites of starch digestion



Effect of ruminal starch digestion on feeding behaviour

Oba & Allen, 2003

	high moisture corn	dry ground corn
DMI, kg/d	20.8	22.5
OM digested in rumen, kg/d	11.3	10.3
DMI/meal, kg	1.9	2.3
Intermeal interval, min	93.9	105.0

Rate of fermentation by grain type

Wheat
Barley
Ground high moisture corn

Dry rolled corn
Steam flaked sorghum
Dry rolled sorghum

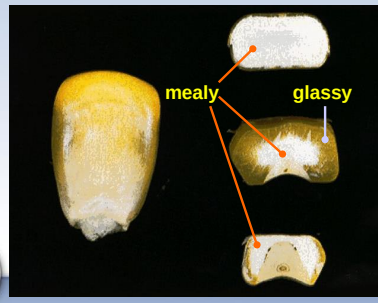
Grain in corn silage

- Concentration is highly variable (<20% to >50%)
  - Typically adjusted by diet formulation
- Digestibility is highly variable (<50%? to > 90%)
- Starch digestibility affects
  - Energy density of the diet
  - Feed intake
  - Efficiency of milk production

Factors affecting starch digestibility for corn silage

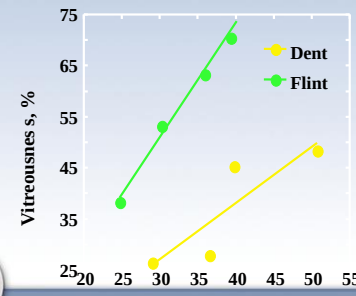
- Kernel moisture content
  - Maturity at harvest
  - Ratio of kernel DM to whole plant DM
    - "stay-green" hybrids
    - Environmental effects
- Endosperm type
  - Floury
  - Vitreous

Endosperm



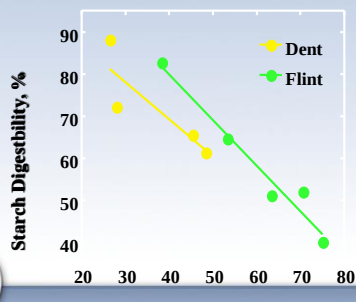
Vitreousness Increases with Increasing DM

Philippeau and Michalet-Doreau, 1997



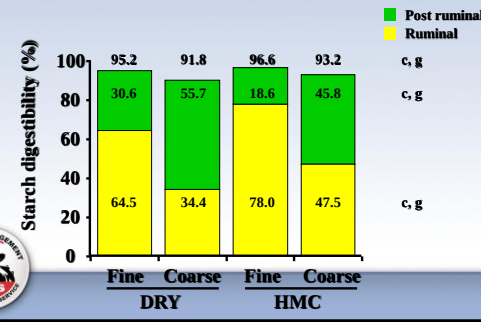
Starch Digestibility Decreases as Vitreousness Increases

Philippeau and Michalet-Doreau, 1997



Effect of conservation method and coarseness of grind on site of digestion of corn grain

Ying et al., 1998 J. Dairy Sci. 81(Suppl.1):339



Non-Forage Fiber Sources

- Fiber concentration (NDF + soluble fiber) similar to forages
  - Most 40-60%
  - Some >75% NDF
- pH, acetate:propionate
  - Increase when substituted for grains
  - Decrease when substituted for forage
- Small particle size
  - Less filling
  - Some long particles required for mat formation

Categories of NFFS

- Starch dilution

  Oathulls, cottonseed hulls, ground corn cobs
- Starch dilution & fermentable fiber

  Soyhulls, beet pulp
- Starch dilution, fermentable fiber & protein

  Brewer's grains, corn gluten feed
- Starch dilution, fermentable fiber, protein & fat

  Whole linted cottonseeds, distiller's grains

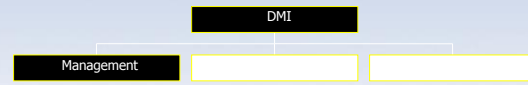
NFFS reduce ruminal starch digestibility

Beet pulp substituted for high moisture corn

0, 6, 12, and 24% of diet DM

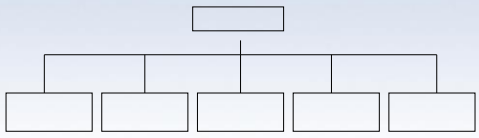
Reduced true ruminal starch digestibility linearly from 47% to 17% without reducing ruminal or total tract digestibility of OM
(Voelker and Allen, 2002)

factors influencing rumen health



Work organisation

Building a blue print:



Work organisation

Goals for every working area:

Feeding

Qualitative goals	Quantitative goals
Mixing and delivering feed	DMI > 24 kg
Push up feed	refusals 3 – 5 % der Gesamtration
Feed storage	Daily milk > 35kg
Look for manure consistency	Milk fat > 3,9 %
Control refusals	?
Maintenance on routine base	

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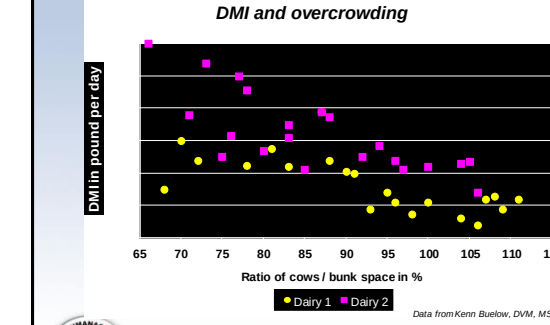
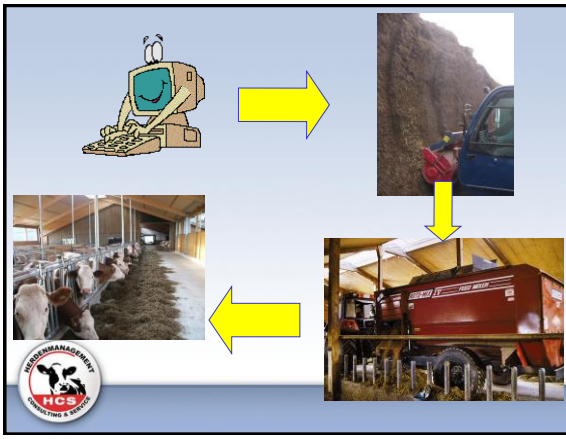
Air, Bunk, & Comfort

	Air	Bunk	Comfort (Heat)
2 Row Barn	Best	2'/Cow	Best
3 Row Barn	Good	>1.5'/Cow	Good
4 Row Barn	Standard	2'/ Cow	Standard
6 Row Barn	Less	>1.5'/Cow	Less



Feeding systems

- TMR
- partial TMR plus Transponder
- AMS



Feed mixing:

Questions:

- Is the weighing scale working and calibrated?
- How homogenous is the TMR?
- Is the feed mushy or particles short chopped?
- Smallest components?
- In which order the single components are filled in?
- Is the mixer waggon overloaded?
- How many different feeders are working?

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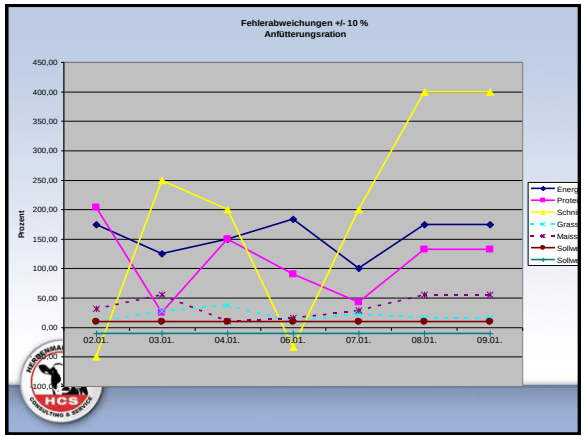
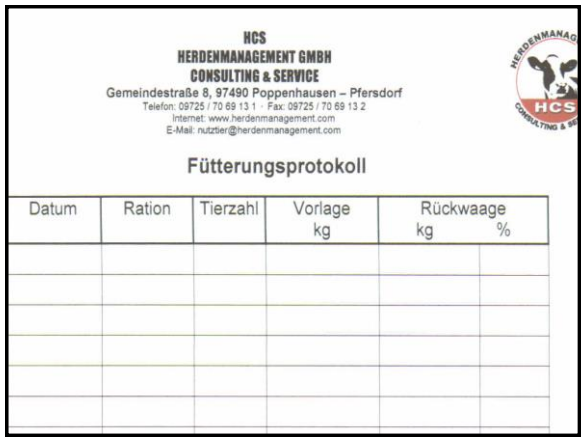


Bunk management:

questions:

- How many hours is feed available??
- Is the first feed looking similar to the ration after several hours?
- How often is feed delivered and pushed up?
- Are there daily records of feed intake?
- How much refusals are left?
- Is the TMR heating up during the day?
- Eating behaviour and bunk use of the cows?
- Is the water supply adequate?



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Fütterungsprotokoll

Datum	Ration	Tierzahl	Vorlage kg	Rückwaage kg	%

Sorting of feed

Fresh ration - 18% on top Feed after 12h - 46% on top

Behavior and control of cows

- Control of cud chewing (50 chewing movements/bite)
- Control of manure (consistency, undigested fibre and kernel particles, smell, colour...)
- Control of behavior (standing, use of free stalls, walking, eating, breathing)
- General condition (health)
- Milk yield, components
- BCS

Take home messages

- Always look on the big picture
- Cows don´t lie