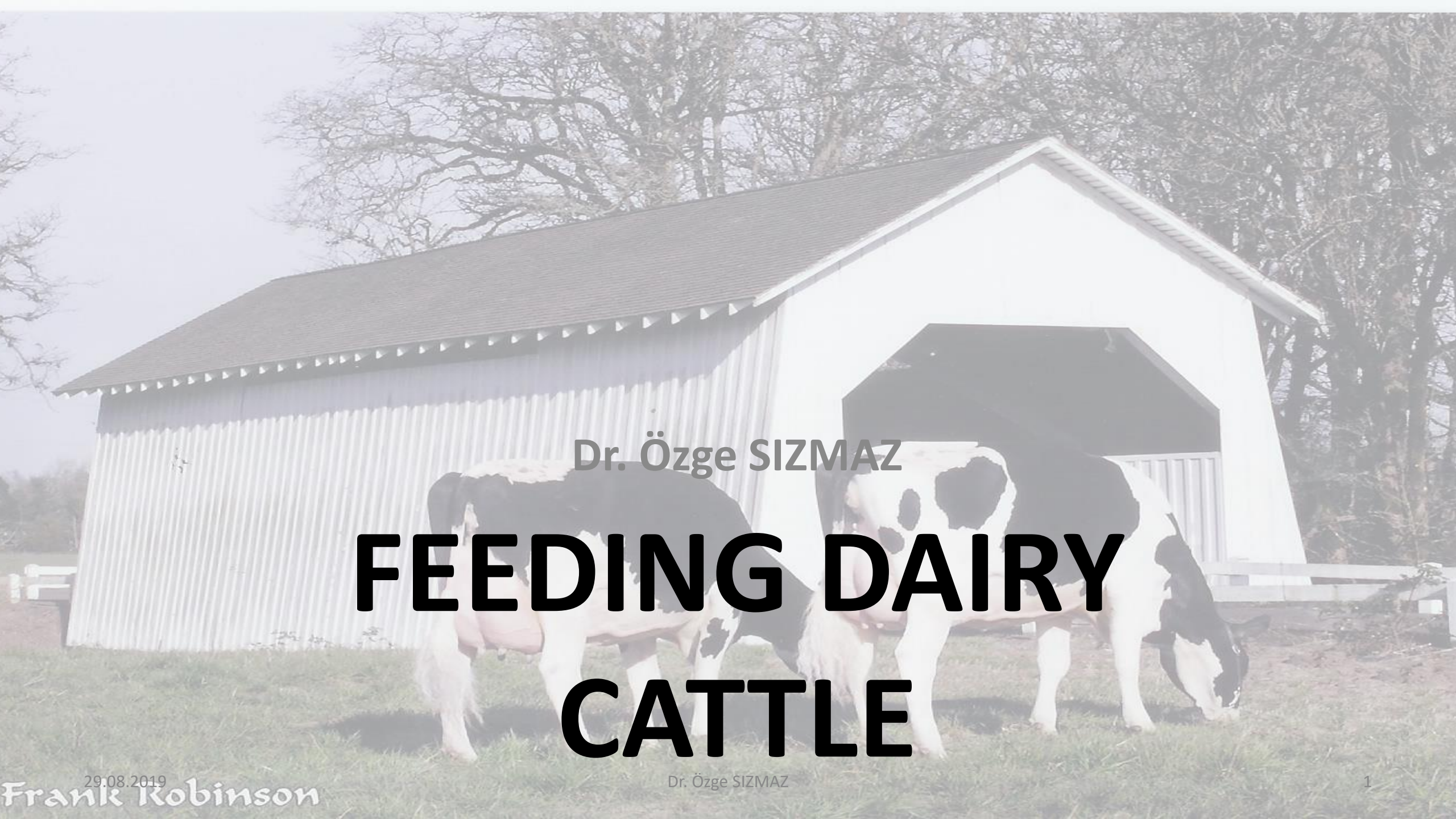


Dr. Özge SIZMAZ

FEEDING DAIRY CATTLE

Terms and definitions

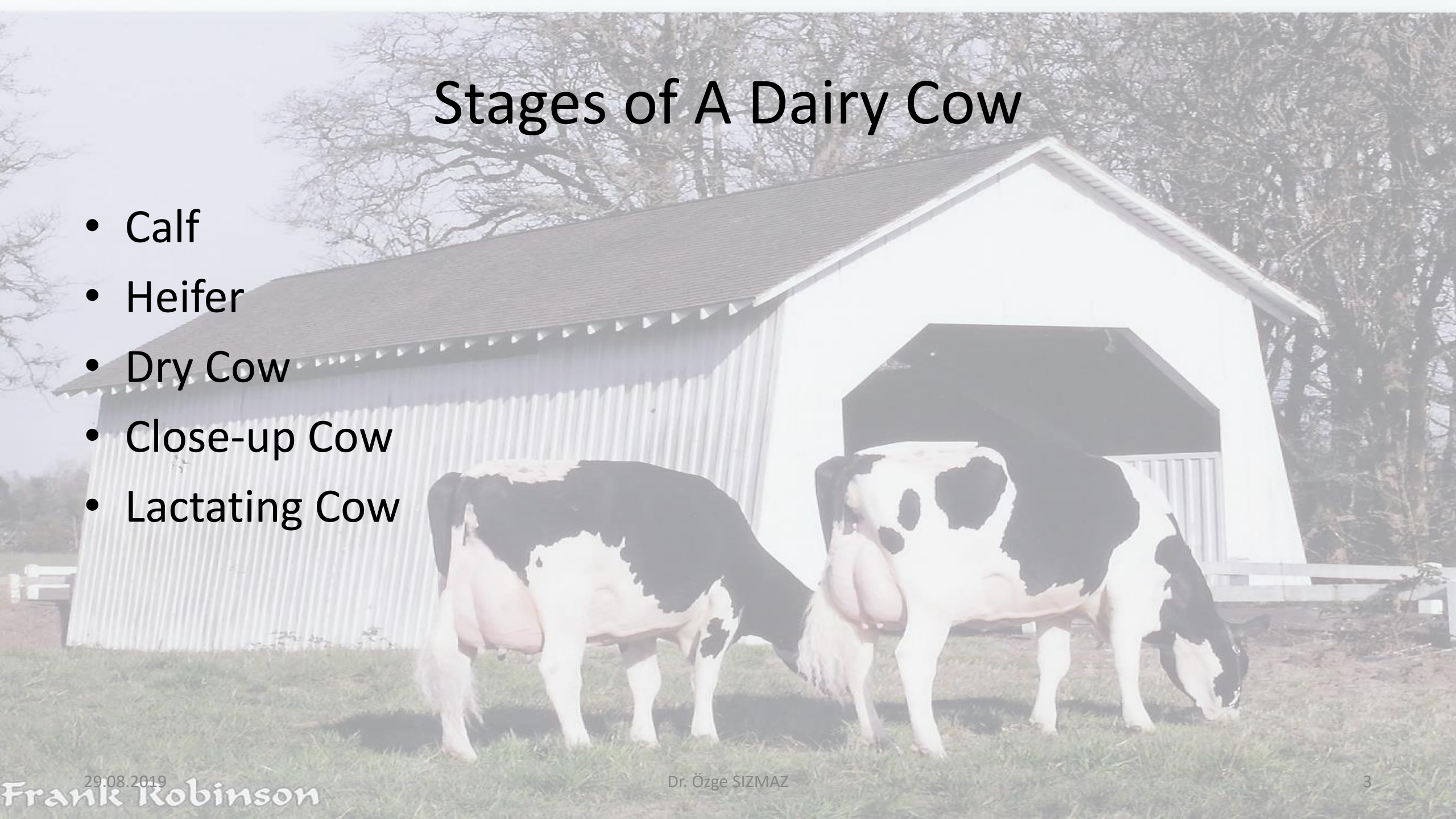
- Lactation period= milk production …….. Dry period (305 d)
- Lactation peak = max. Milk yield (wks 3-8)

NUTRIENTS

- Carbohydrate--Nutrient supplying most of the energy needs for animals; usually easily digested and absorbed
- Fiber--Carbohydrate with a digestibility of less than 50%
- Lignin--Non-digestible portion of fiber that provides the "bulk" necessary for dairy animals
- Protein--Nutrient made up of chains of amino acids which contain nitrogen; "building blocks" of muscles
- NE--Net energy or energy left in feeds after energy used in digestion has been subtracted
- NElac--Net energy value used for maintenance and milk production in lactating cows

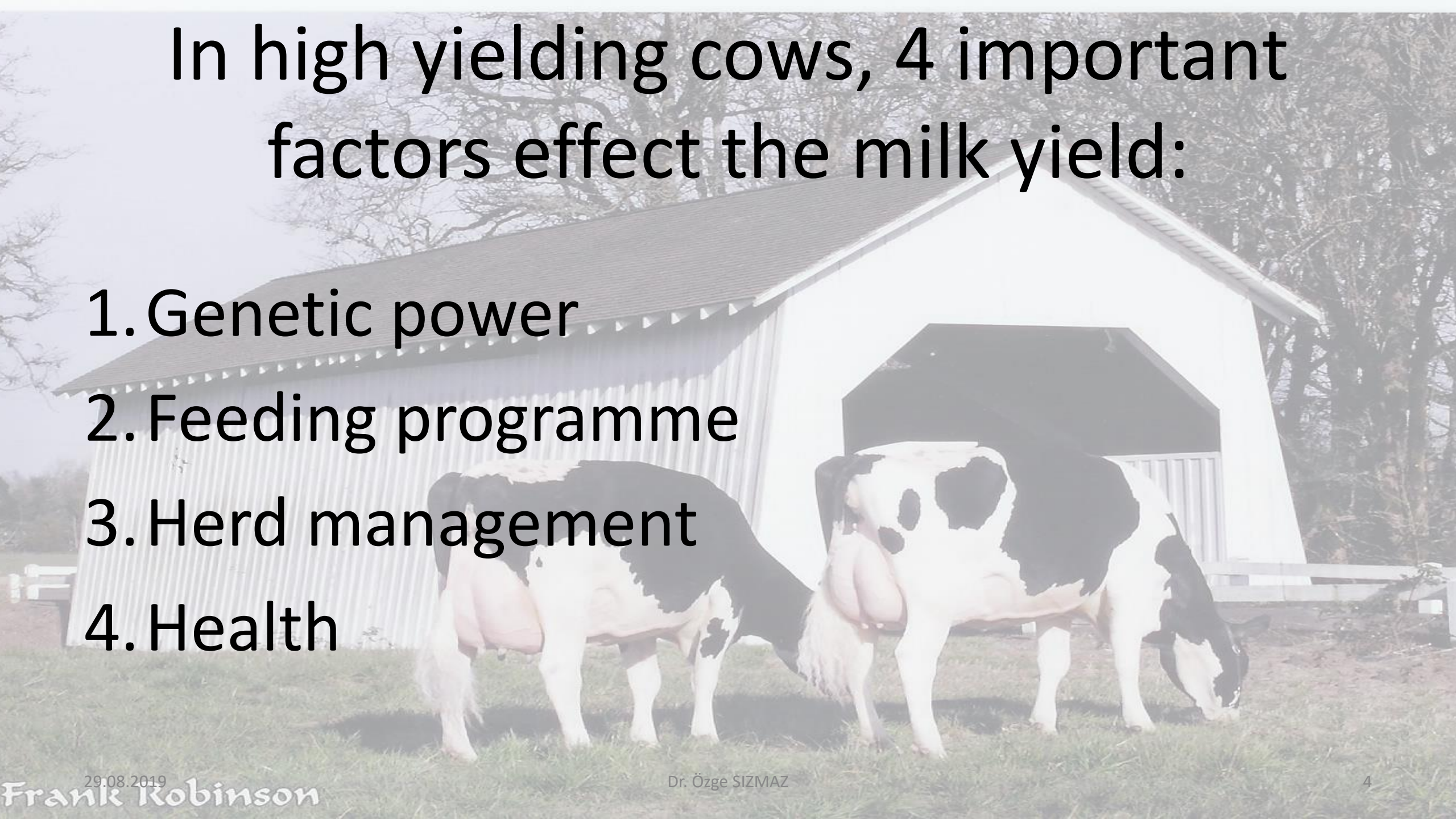
Stages of A Dairy Cow

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



In high yielding cows, 4 important factors effect the milk yield:

1. Genetic power
2. Feeding programme
3. Herd management
4. Health



Factors affecting success in dairy cattle

- Proper shelter → proper feeding programme → effective insemination programme
- Quality breeder
- Milking programme
- Quality personel
- Herd health programme

MONEY

Feeding of rumen microorganisms

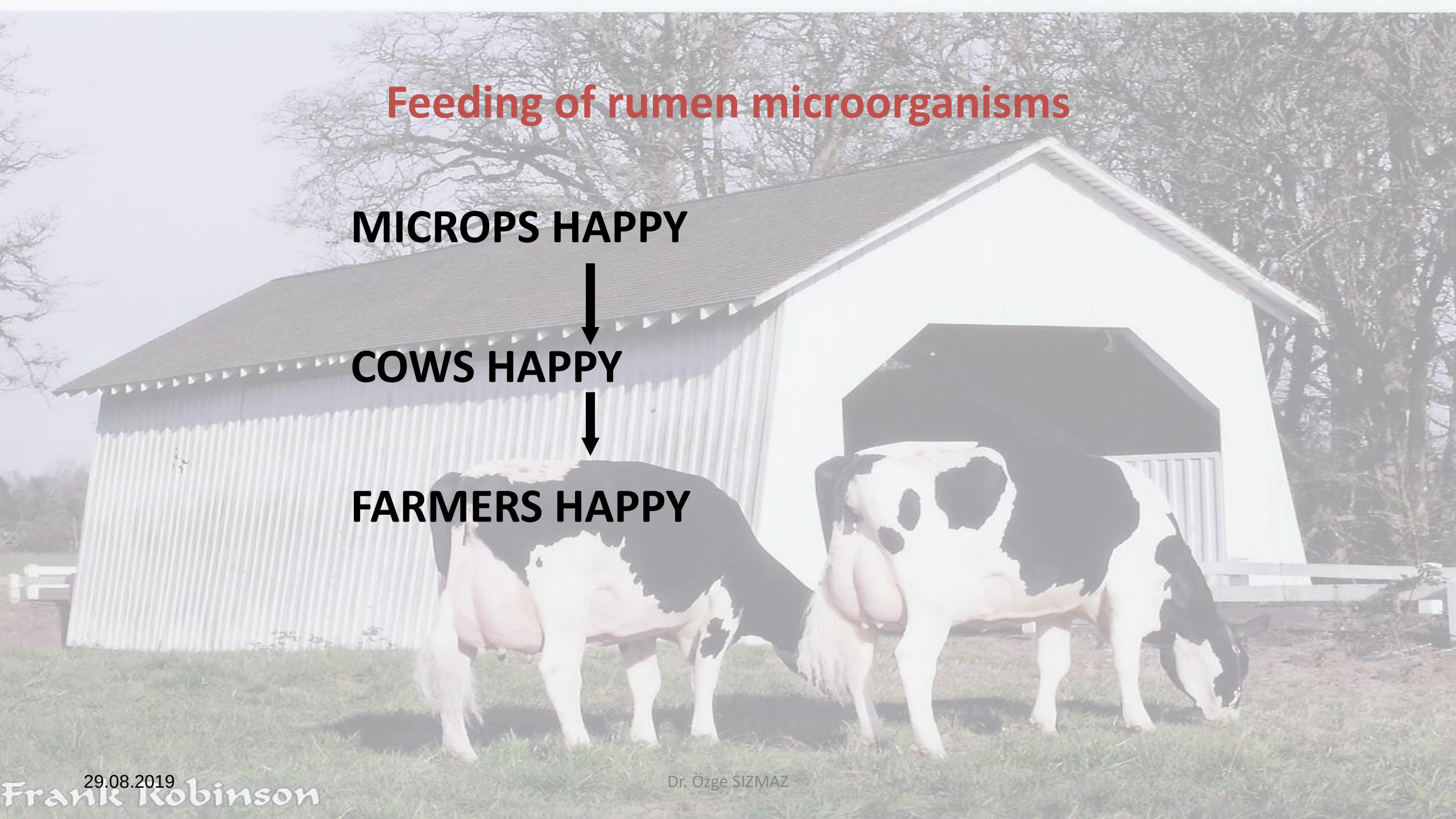
MICROPS HAPPY

↓

COWS HAPPY

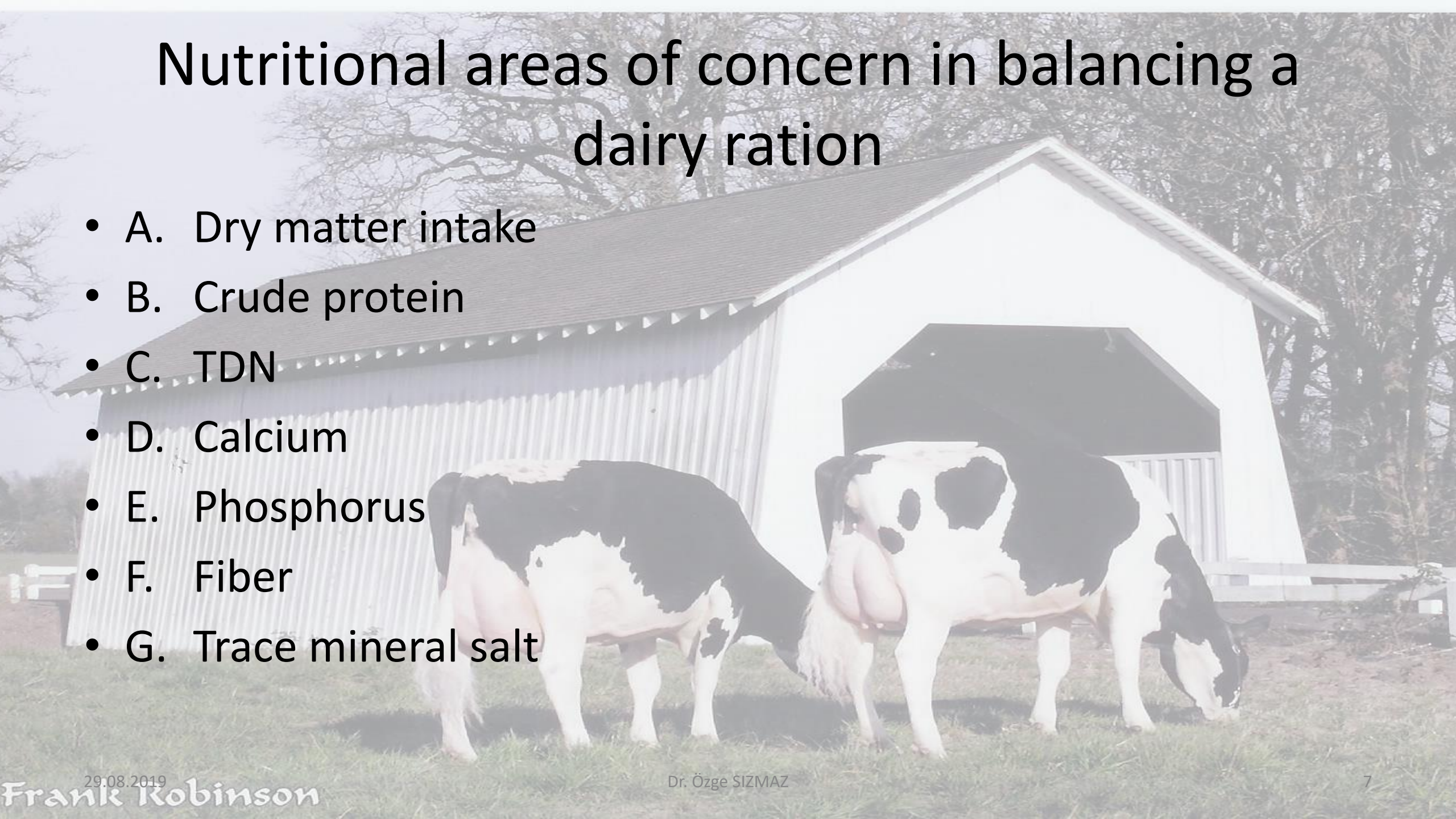
↓

FARMERS HAPPY



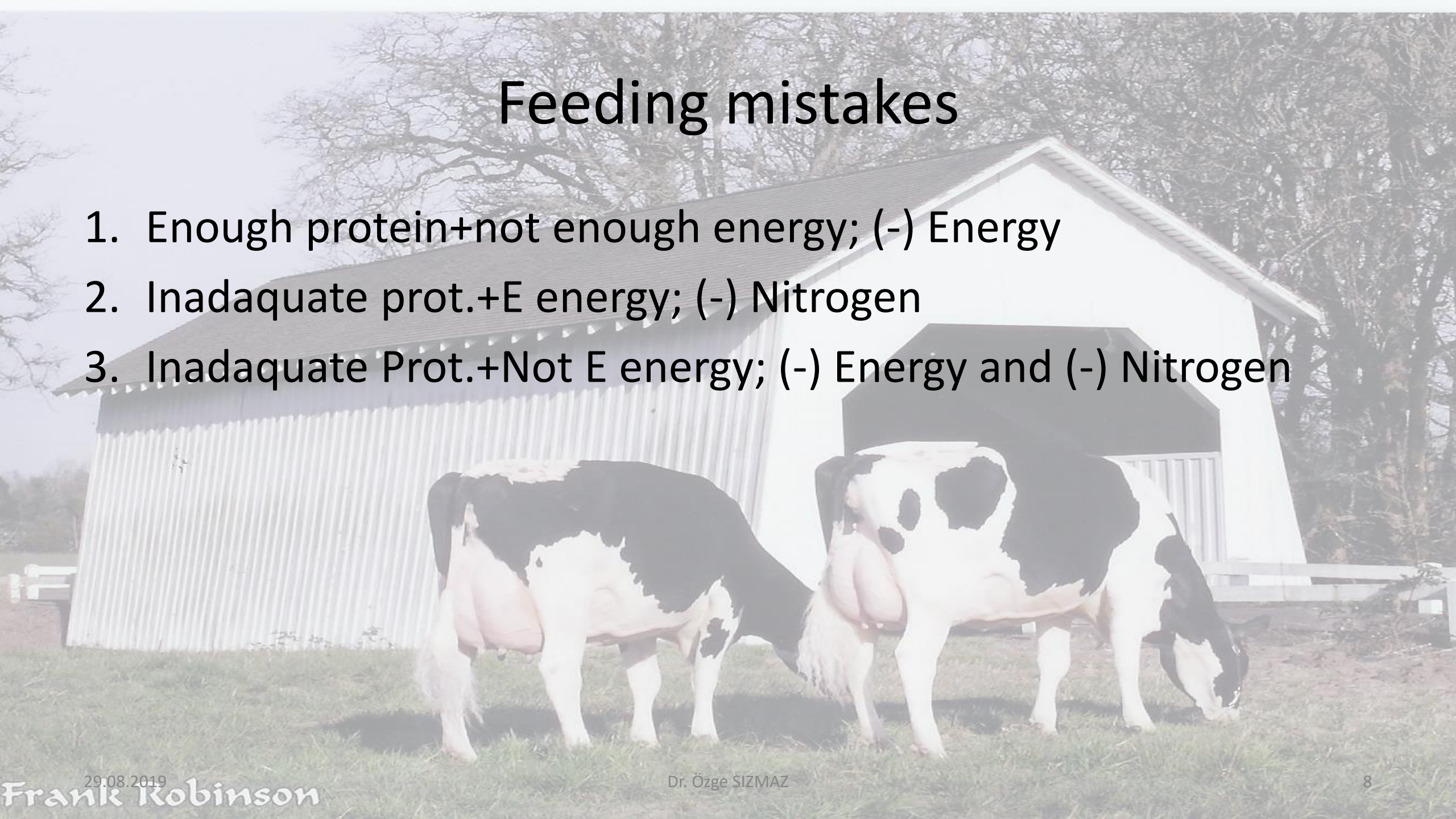
Nutritional areas of concern in balancing a dairy ration

- A. Dry matter intake
- B. Crude protein
- C. TDN
- D. Calcium
- E. Phosphorus
- F. Fiber
- G. Trace mineral salt



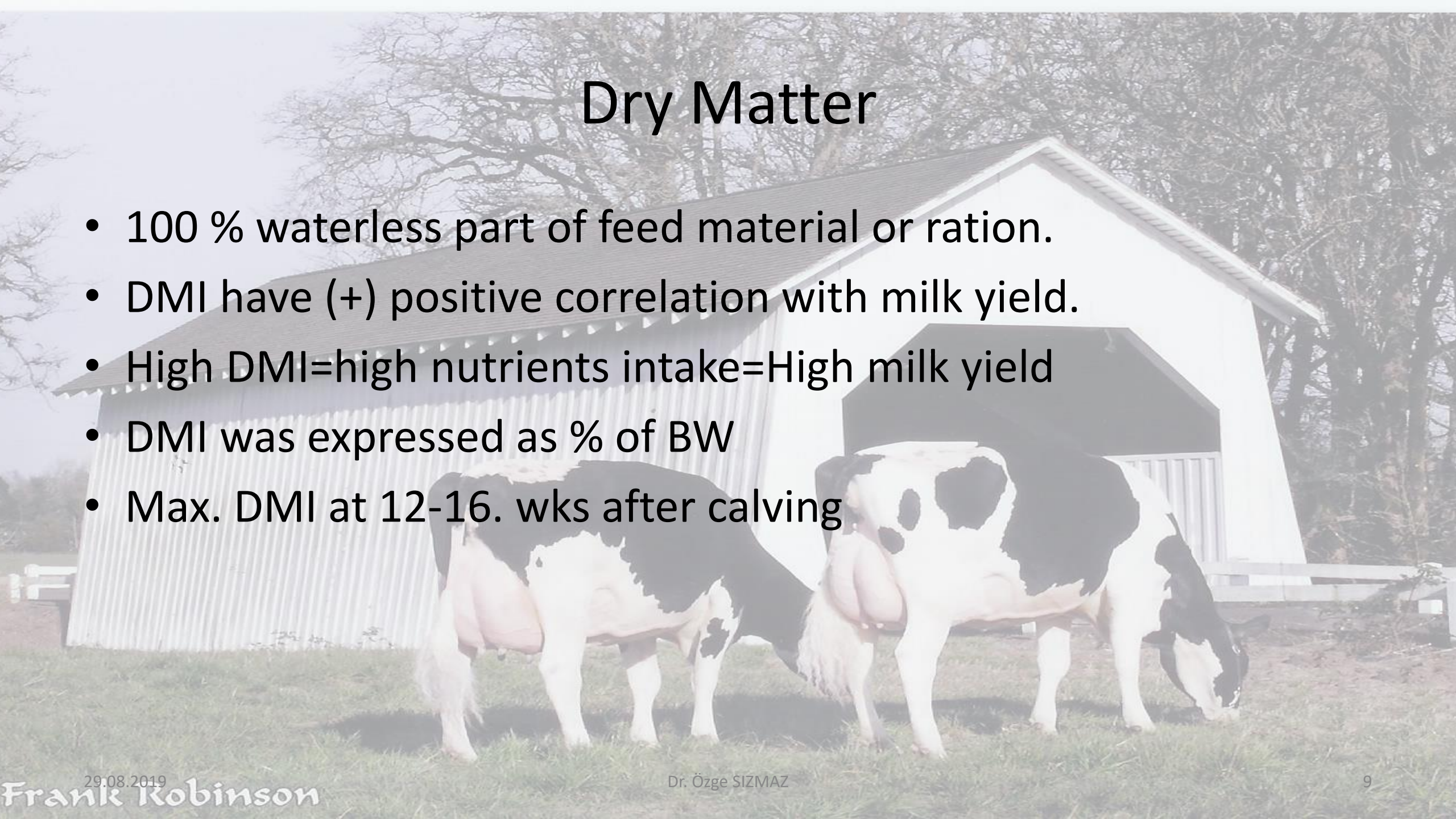
Feeding mistakes

1. Enough protein+not enough energy; (-) Energy
2. Inadaquate prot.+E energy; (-) Nitrogen
3. Inadaquate Prot.+Not E energy; (-) Energy and (-) Nitrogen



Dry Matter

- 100 % waterless part of feed material or ration.
- DMI have (+) positive correlation with milk yield.
- High DMI=high nutrients intake=High milk yield
- DMI was expressed as % of BW
- Max. DMI at 12-16. wks after calving



DM Needs

- DM, kg=(BW/100)+5+MYx0.3

BW=Body Weight

MY=Milk Yield

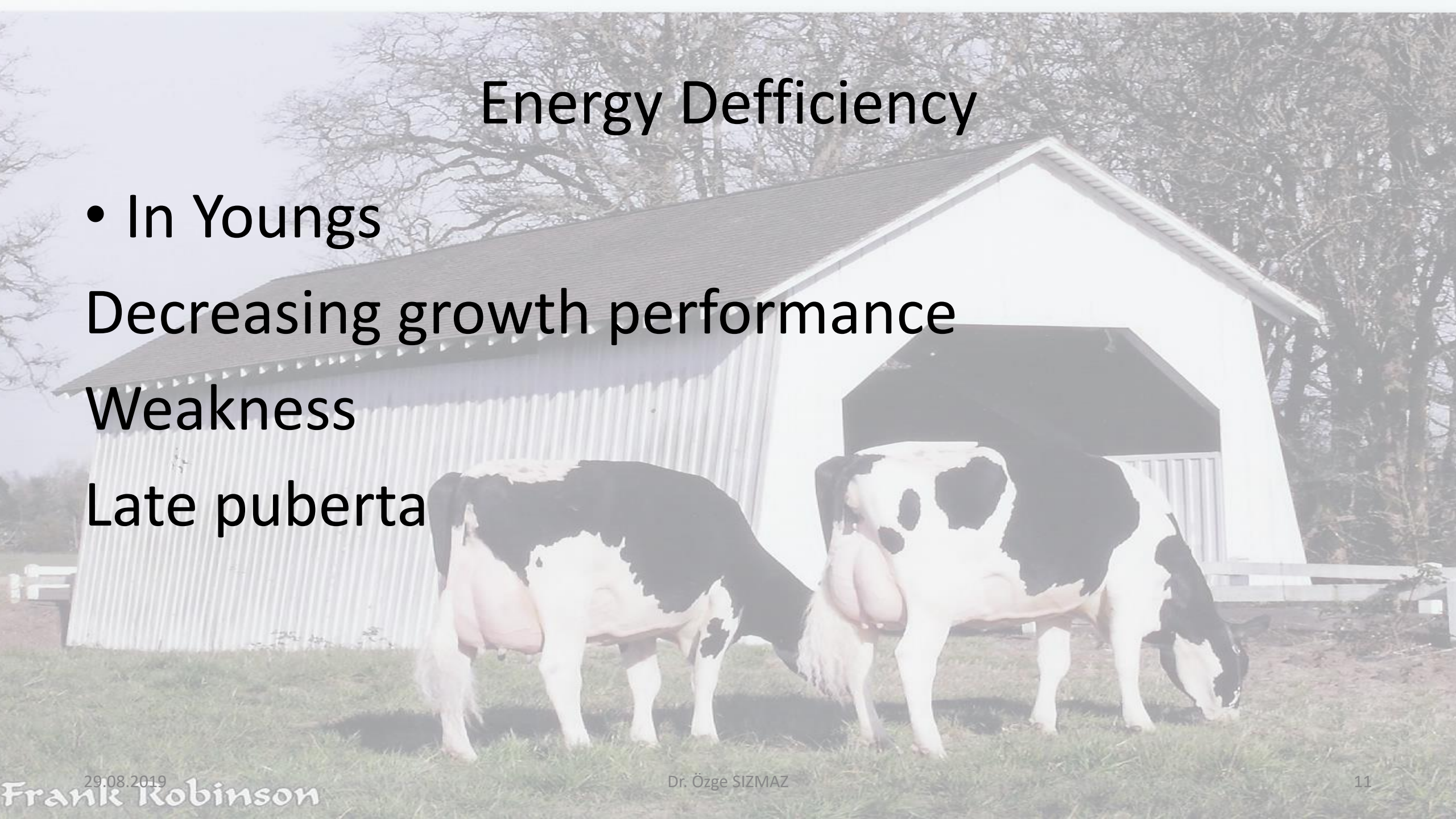
Energy Defficiency

- In Youngs

Decreasing growth performance

Weakness

Late puberta



Energy Defficiency

- In high yielding cows

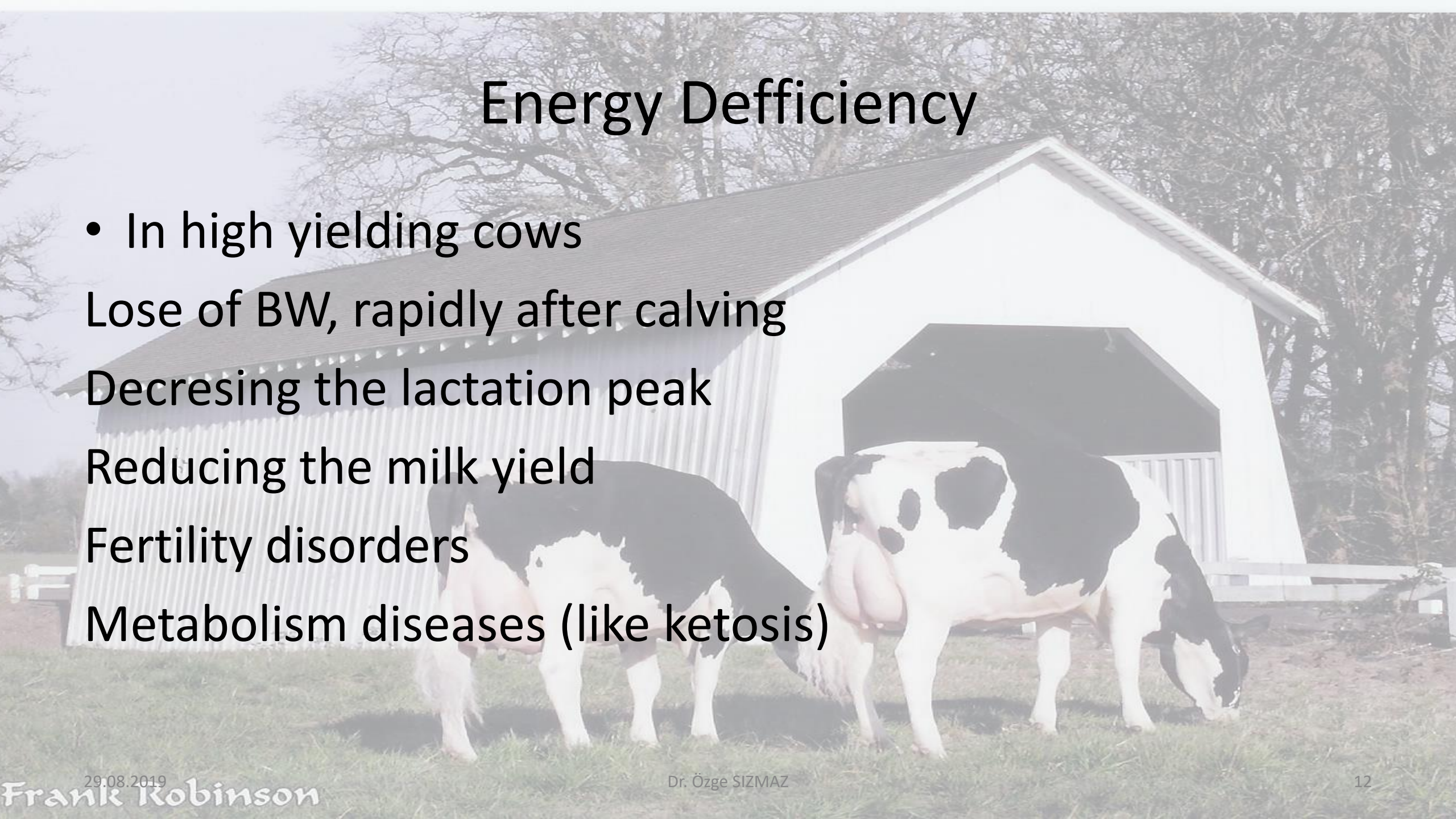
Lose of BW, rapidly after calving

Decresing the lactation peak

Reducing the milk yield

Fertility disorders

Metabolism diseases (like ketosis)



Energy Excess

- Youngs

Fatty udder at 4-10 months period

Decreasing the performance

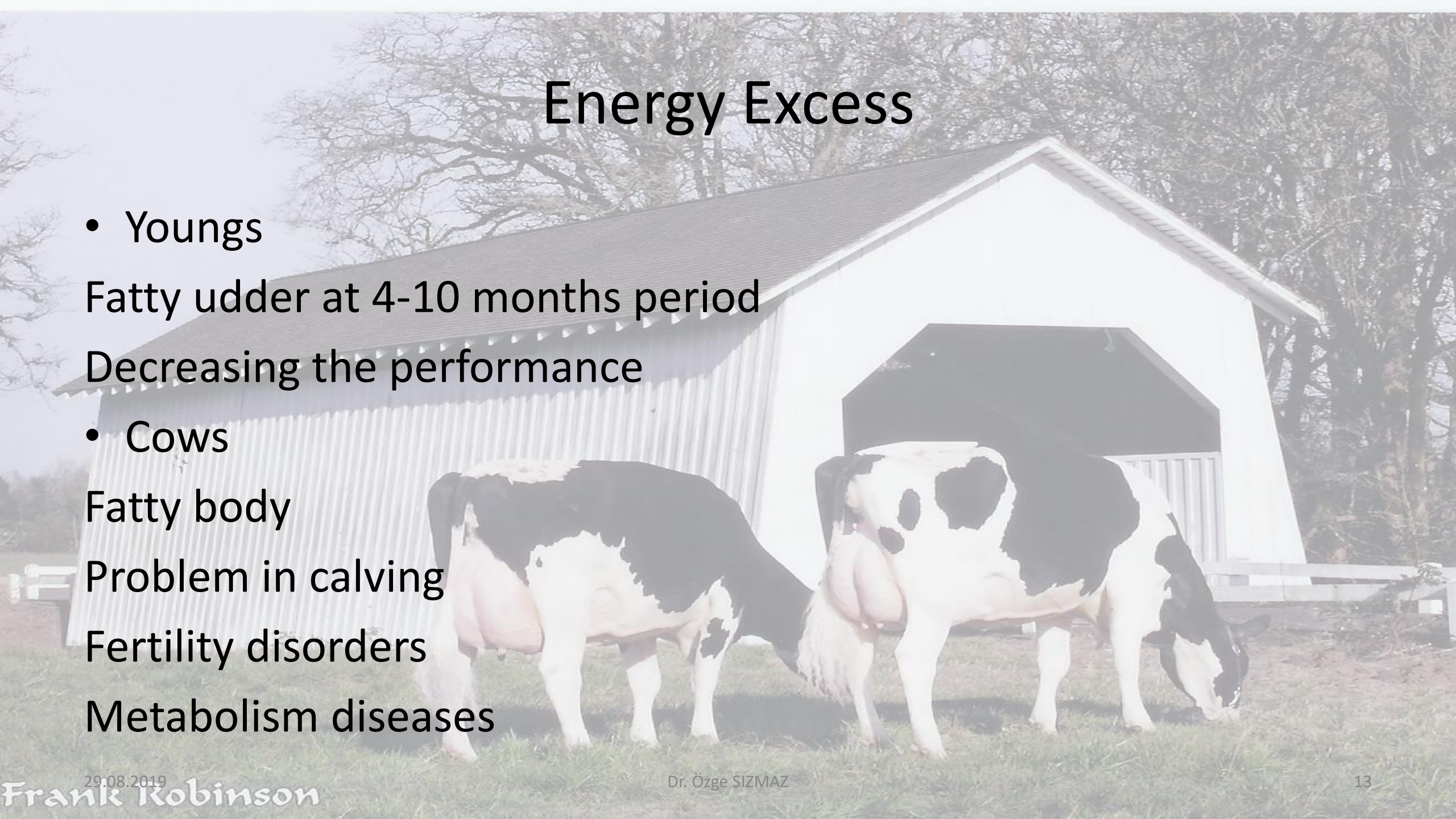
- Cows

Fatty body

Problem in calving

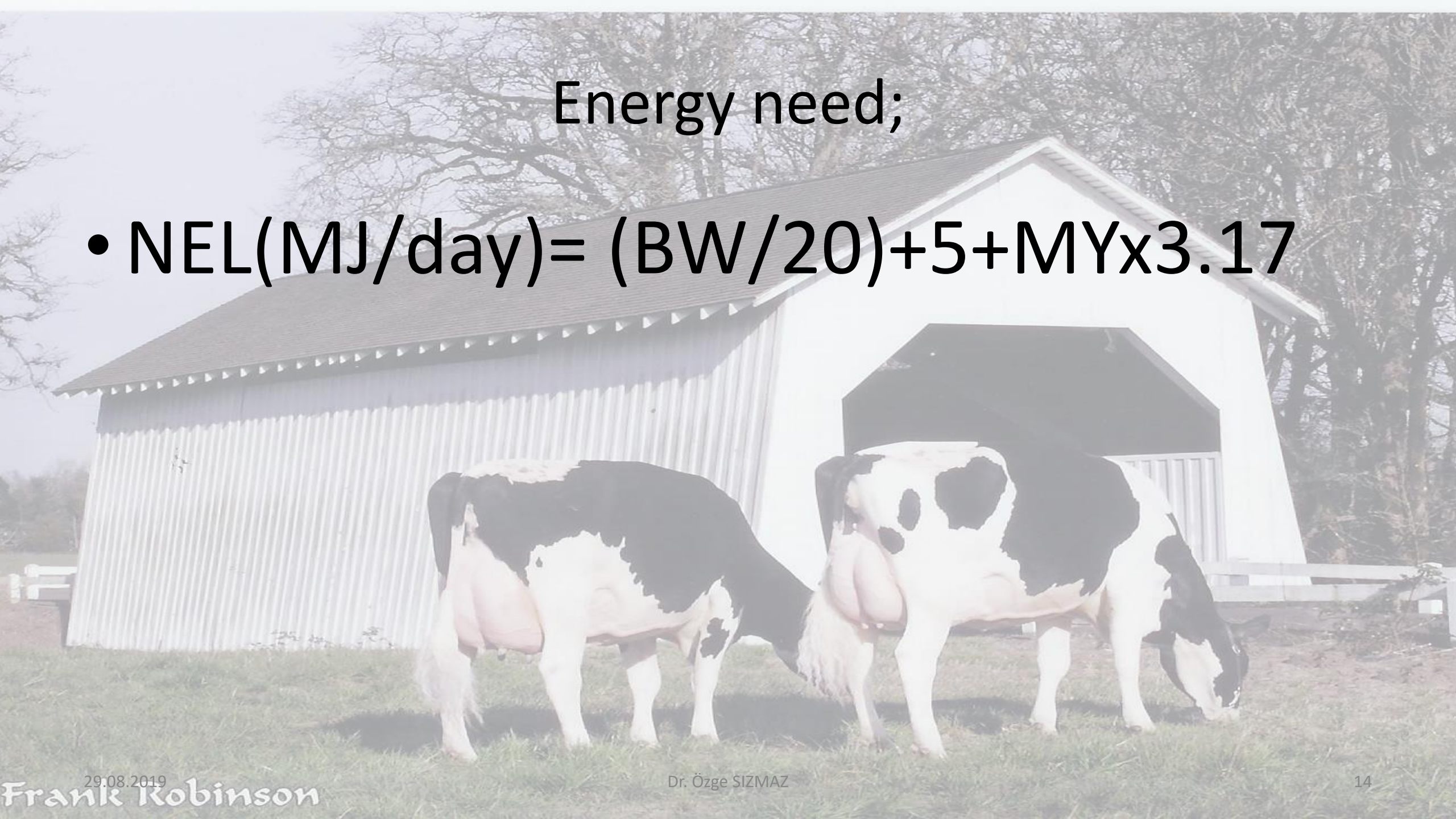
Fertility disorders

Metabolism diseases



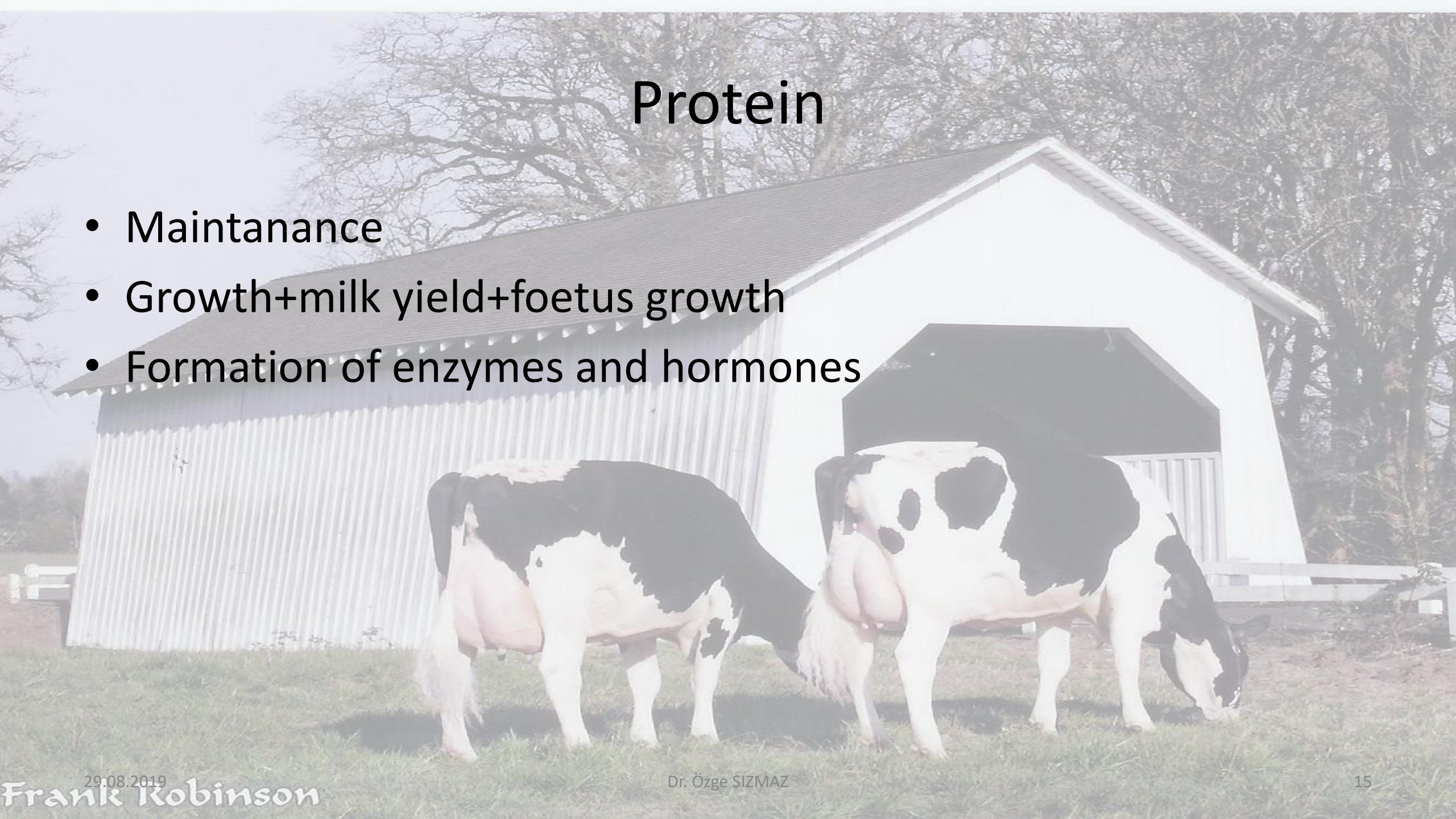
Energy need;

- NEL(MJ/day)= (BW/20)+5+MYx3.17



Protein

- Maintanance
- Growth+milk yield+foetus growth
- Formation of enzymes and hormones

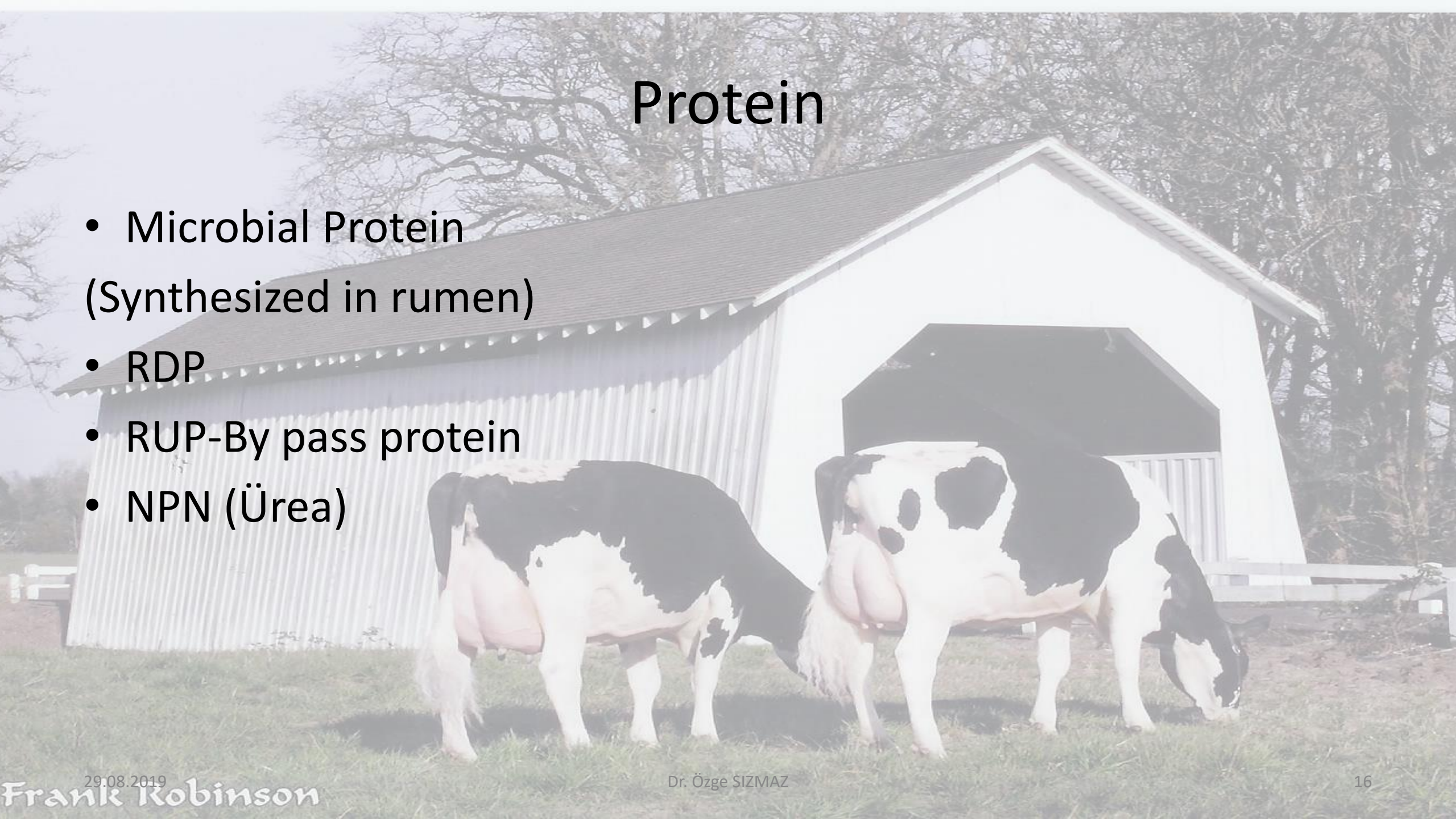


Protein

- Microbial Protein

(Synthesized in rumen)

- RDP
- RUP-By pass protein
- NPN (Ürea)

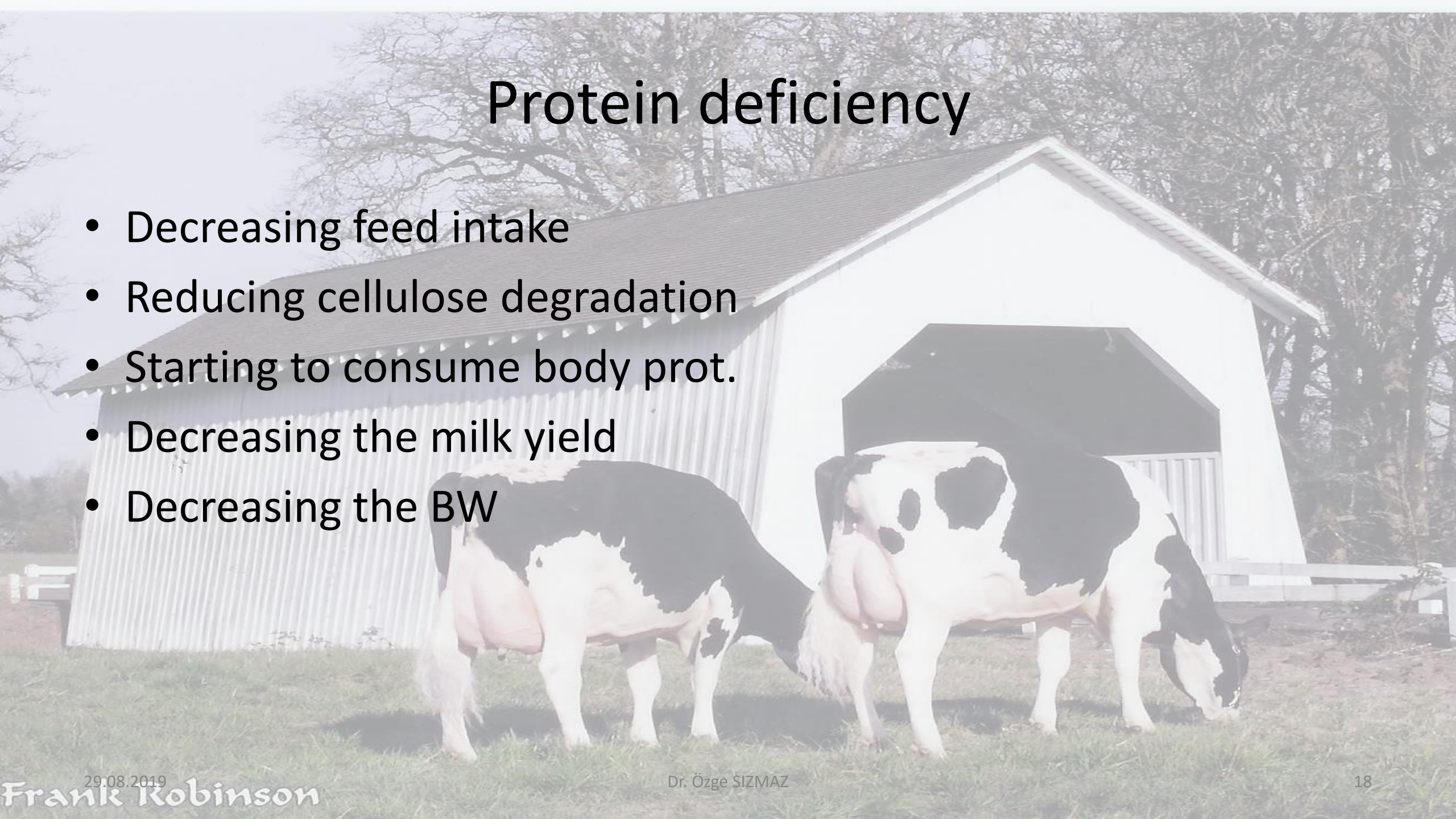


Urea

- Should be mixed homogenousely in the feed
- Should be given to cows by habituate
- Should be used with easy soluble carbonhydrates sources (molasses, cereal grains etc.)
- Should be added with low protein and high energy level diets.
- Sholud be supplied max 33 % N of cow's need
- Should be added to the total ration max1% in DM, to concentrate 3%

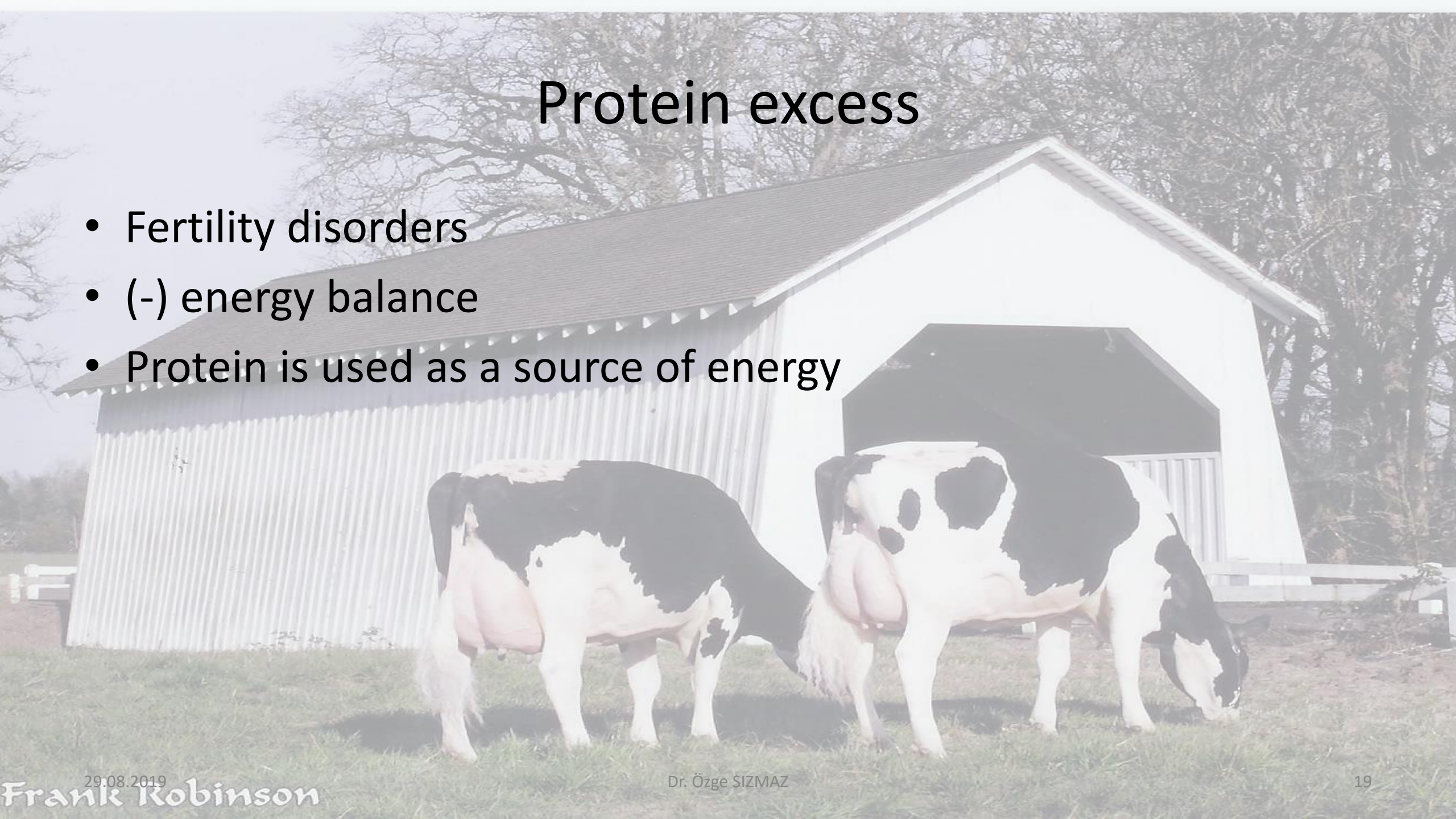
Protein deficiency

- Decreasing feed intake
- Reducing cellulose degradation
- Starting to consume body prot.
- Decreasing the milk yield
- Decreasing the BW



Protein excess

- Fertility disorders
- (-) energy balance
- Protein is used as a source of energy



The Role of Fiber in Dairy Cow Nutrition Programs

- The fiber component of the feed is the lignin, cellulose and hemi cellulose in the plant. The fiber level is quoted in three terms; Acid Detergent Fiber (ADF), Neutral Detergent Fiber, and Lignin. In some cases the term Crude Fiber is quoted, but it is an inaccurate measure of the amount of fiber in the feed. Crude Fiber is not accurate because during the testing process a portion of the ADF and NDF is lost in the process. The only accurate measures are ADF and NDF.
- ADF indicates the amount of cellulose and lignin that are in the feed. These components are highly non digestible but are essential for rumen function. The higher the level of ADF that is in the feed, the more feed is being put in the rumen that can not be used. The correct amount of ADF in the ration is 16% to 19%. Most of this will come from the forages in the ration.

The Role of Fiber in Dairy Cow Nutrition Programs

- NDF represents all of the fiber in the plant, including hemi cellulose, cellulose, and lignin. NDF is an indicator of how much the cow can eat before feeling “full” and not eating more. The correct amount of NDF in the ration is 27% to 30%. It is also recommended that **75% of the NDF be derived from the forages** in the ration. Higher levels of NDF will discourage feed intake and this will result in a deficiency in protein and energy. Too much NDF will discourage intake because not enough buffers are produced to offset the acid produced by the fermentation in the rumen. It is important to remember that too much fiber or too little fiber can cause the cow to “go off feed” and this will reduce production and performance of the cow.

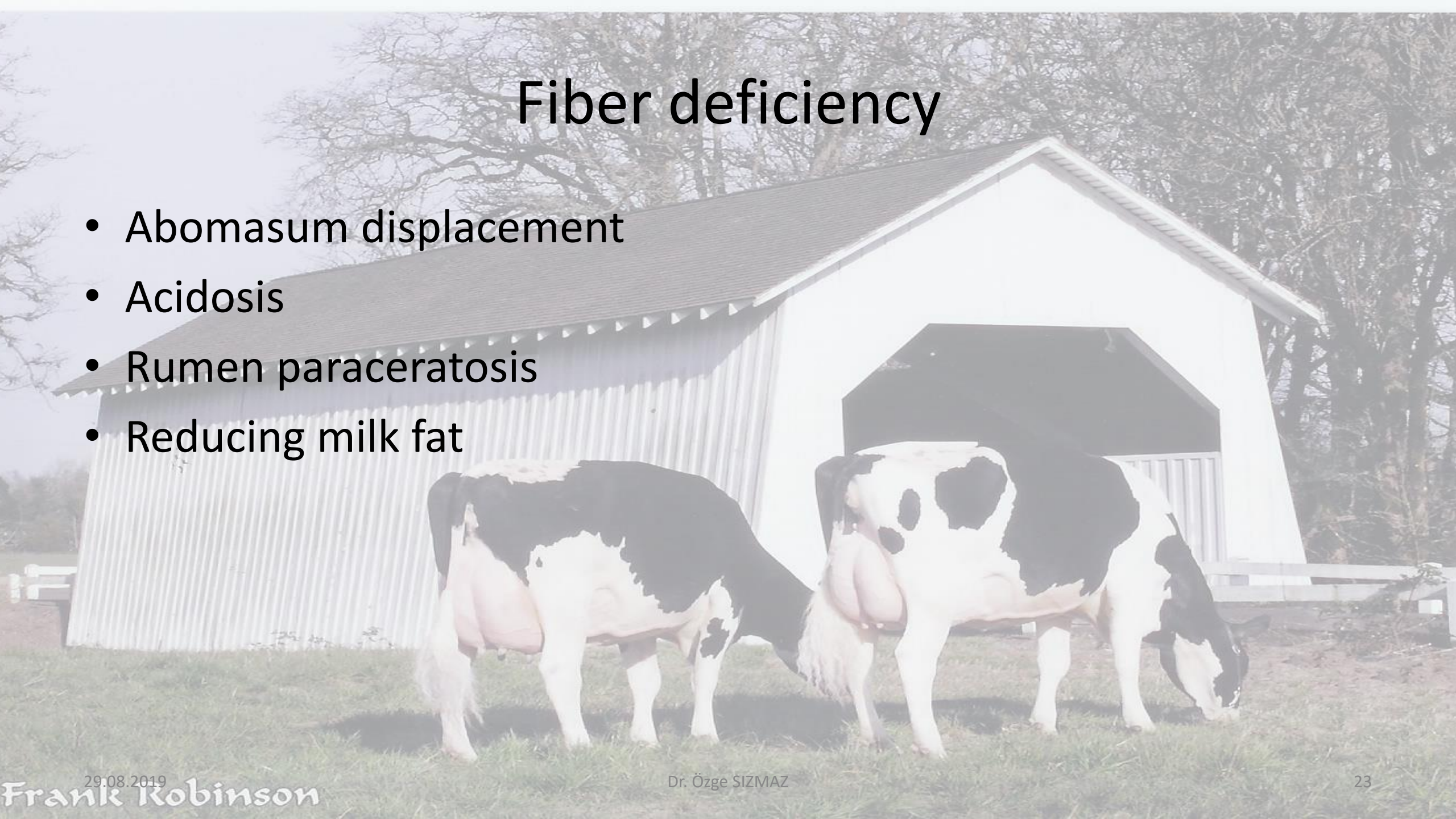
Particle size and structure of the fiber are also important,

- The ration provided to the cow may have enough NDF, but if the fiber is too long or if it lacks structure, NDF will not be effective and rumen problems will be common in the herd. This will also result in lower milk production, loss of body condition, and difficult in getting the cow bred back.

- The correct particle size can be determined by doing a particle test on the feeds. The ration when delivered to the cow should not have more than 8% of the forage in pieces longer than 2.5 cm.

Fiber deficiency

- Abomasum displacement
- Acidosis
- Rumen paraceratosis
- Reducing milk fat

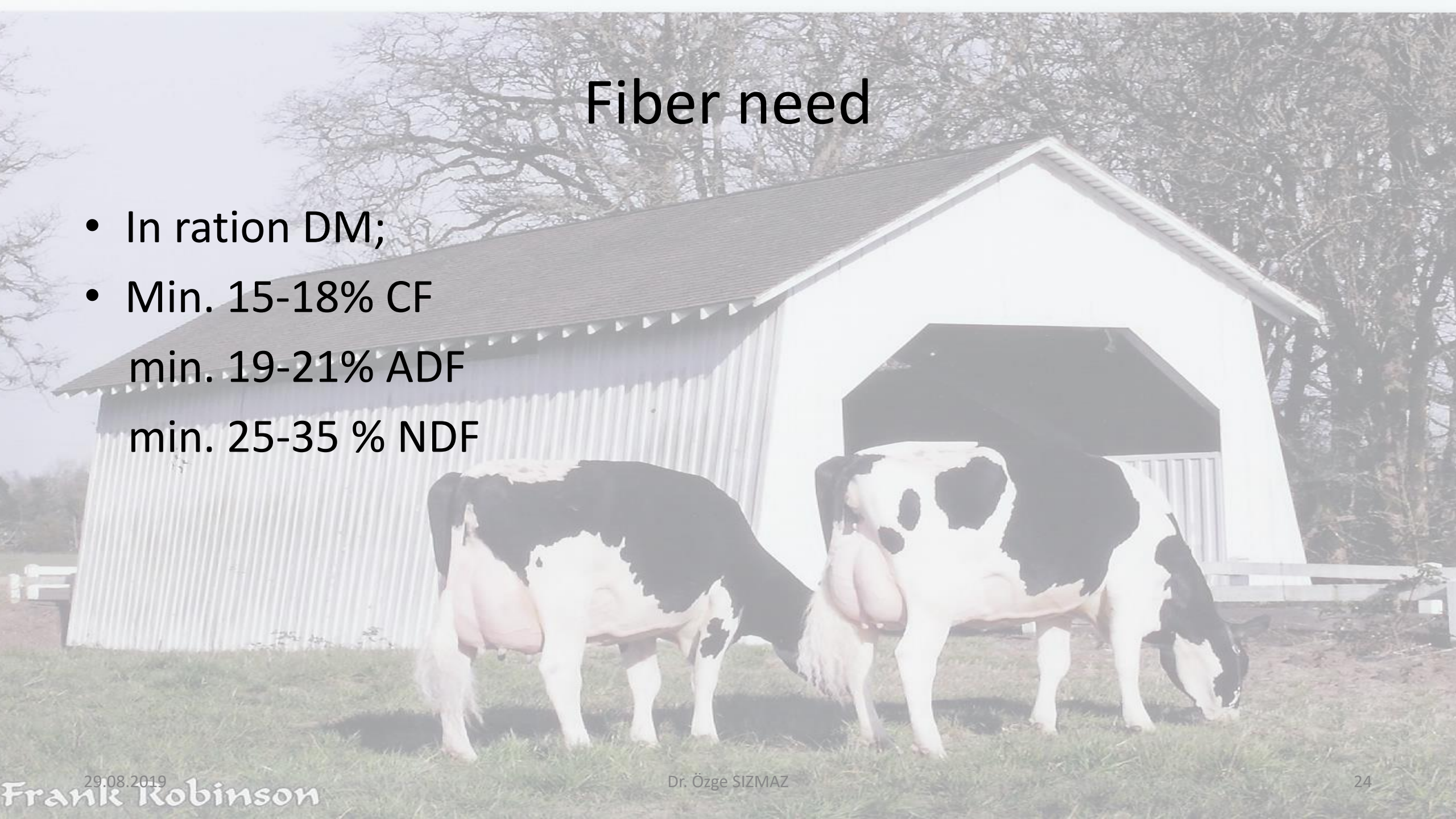


Fiber need

- In ration DM;
- Min. 15-18% CF

  min. 19-21% ADF

  min. 25-35 % NDF



TMR

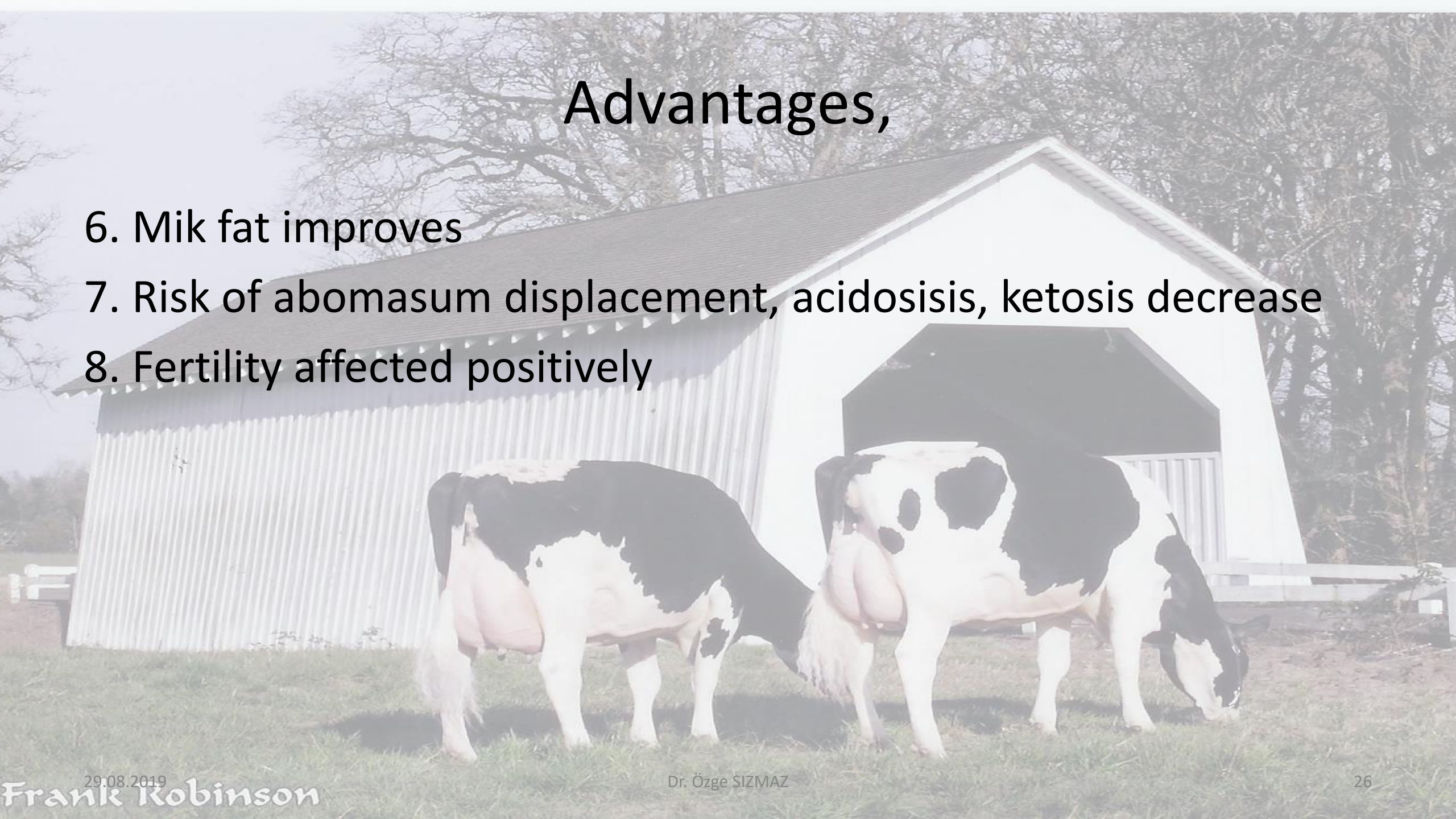
=Forage+Cereal+feed with protein+Vitamin+Mineral

Advantages

1. is effective to increasing milk production
2. Optimum ration formulation is supplied
3. Stable ration compozition is provided
4. Tasteless feed are masked
5. Registering is controlled

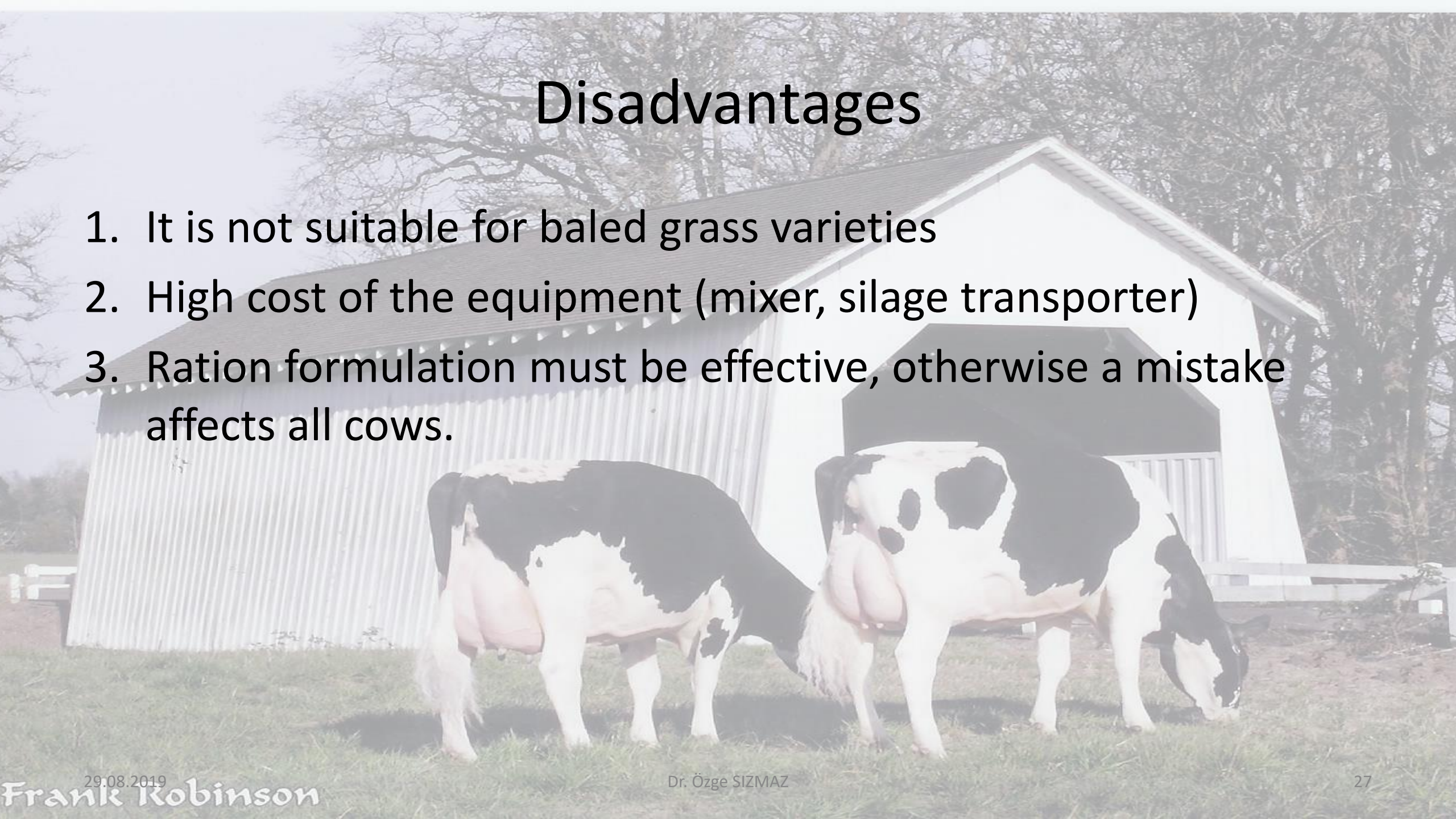
Advantages,

6. Mik fat improves
7. Risk of abomasum displacement, acidosisis, ketosis decrease
8. Fertility affected positively



Disadvantages

1. It is not suitable for baled grass varieties
2. High cost of the equipment (mixer, silage transporter)
3. Ration formulation must be effective, otherwise a mistake affects all cows.



Feeding programme to stages of lactation period

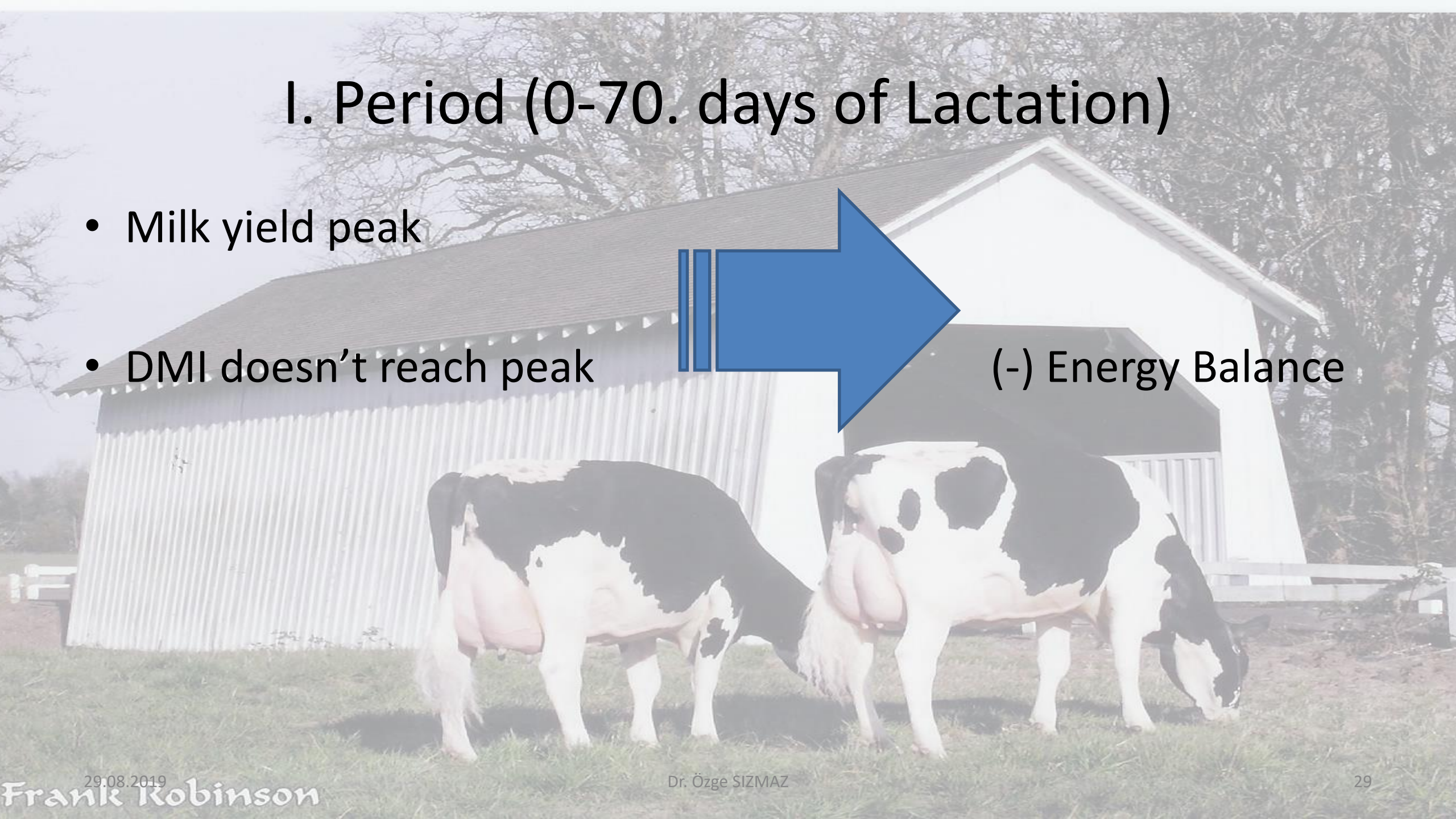
- I. Period: first 10 wks after calving
- II. Period : wks of 10-20 after calving
- III. Period: 21-42. wks after calving
- IV. Period: Dry period, last 2 months of gestation

- Transition period: last 3 wks of gestation (close up dry period) and first 3 wks of lactation (early fresh period)

I. Period (0-70. days of Lactation)

- Milk yield peak
- DMI doesn’t reach peak

(-) Energy Balance



I. Period

- It is common knowledge that the early lactating cows do not eat as much feed as they do between the second and third months of lactation period, even though the level of milk production may be the same. Feed intake lags behind peak milk production by about two to four weeks. This results in a **negative energy balance** and, as such, body reserves are mobilized to overcome the energy deficit, which results in some body weight loss. Although it is normal for high-producing cows to lose weight in early lactation, the energy, and especially the protein, available from body stores can supply only a limited amount of the animals needs.

I. Period

- As body fat is mobilized to produce more milk, proportionally more energy is available than protein. Therefore, the percent of protein in the ration during early lactation period should be higher in order to maximize the efficiency of energy utilization and to meet the added protein needs. Because high-producing cows lose body weight in early lactation, a number of studies have attempted to correlate body-weight losses to performance.

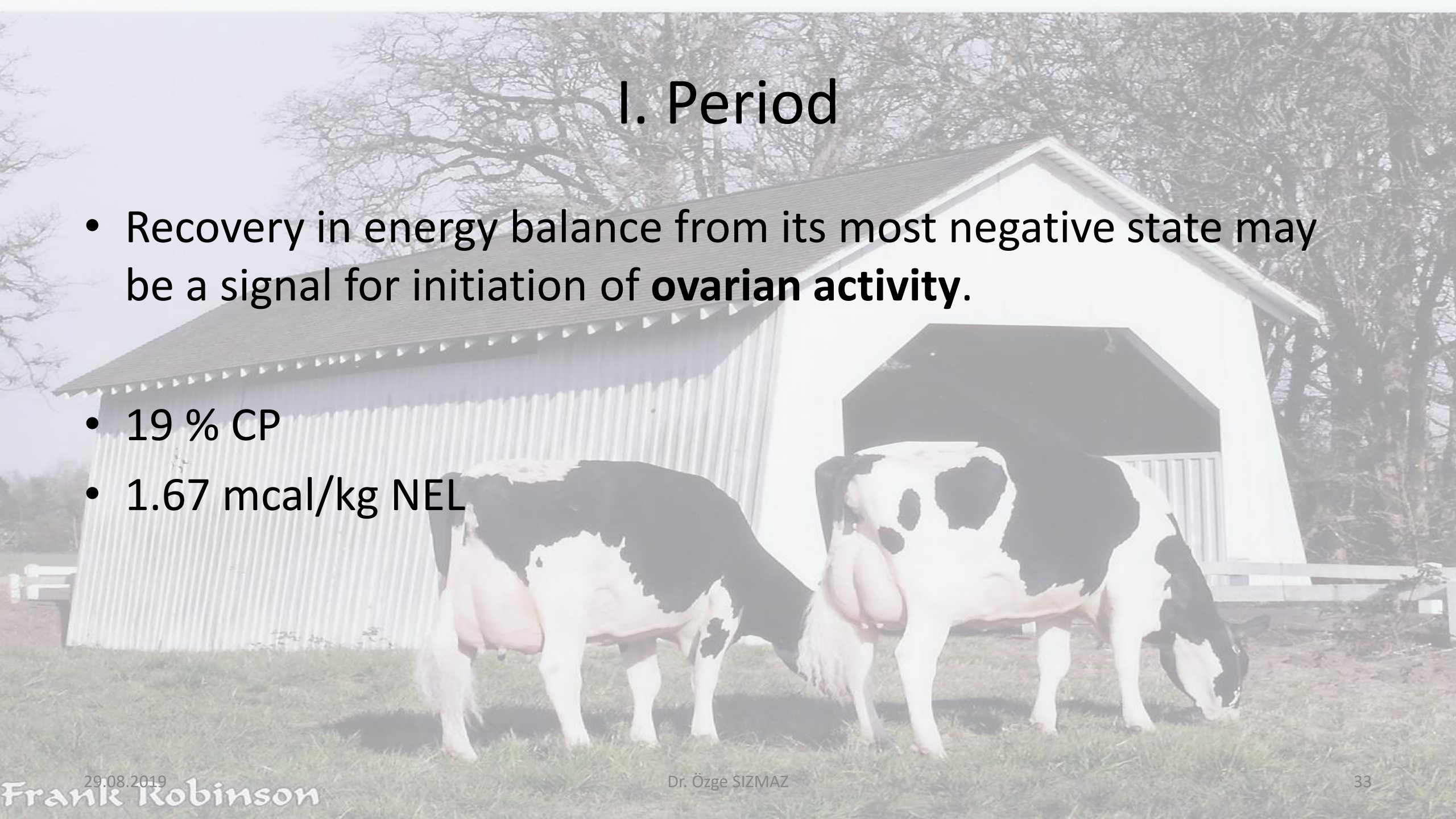
I. Period

- Both the extent of negative energy balance and the rate of recovery of energy balance appear to be important. In well-fed cows, the negative balances of energy begin to improve at about week four of lactation.

I. Period

- Recovery in energy balance from its most negative state may be a signal for initiation of **ovarian activity**.

- 19 % CP
- 1.67 mcal/kg NEL

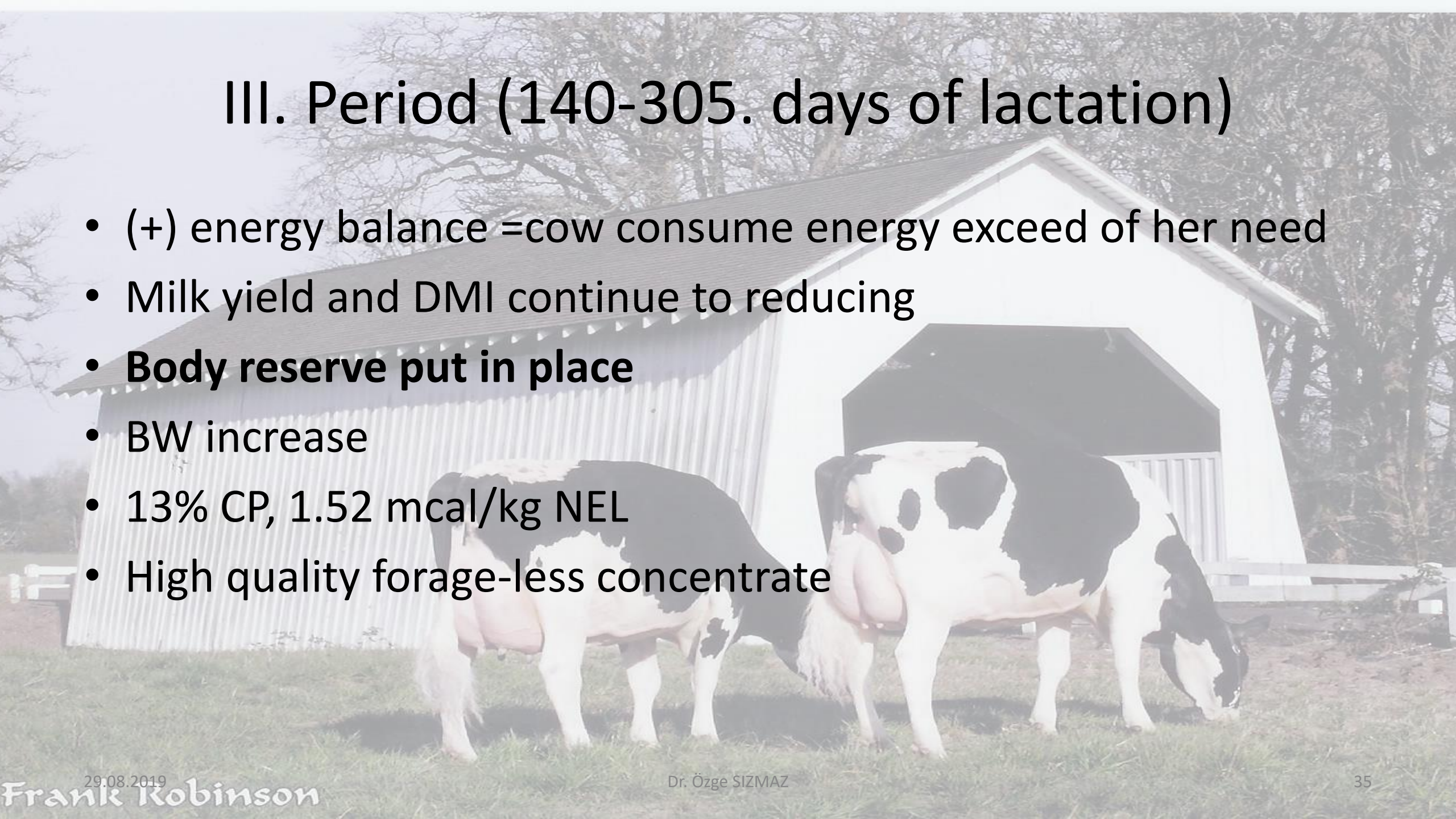


II. Period (70-140. days of lactation)

- DMI peak
- Energy in balance
- Energy need for milk is taken by DM
- Cow stop the consume of body store
- Cow should taken high quality forages
- Concentrate should given max. 2-3% of BW
- 14% CP, 1.65 mcal/kg NEL

III. Period (140-305. days of lactation)

- (+) energy balance =cow consume energy exceed of her need
- Milk yield and DMI continue to reducing
- **Body reserve put in place**
- BW increase
- 13% CP, 1.52 mcal/kg NEL
- High quality forage-less concentrate



Body reserve put in place

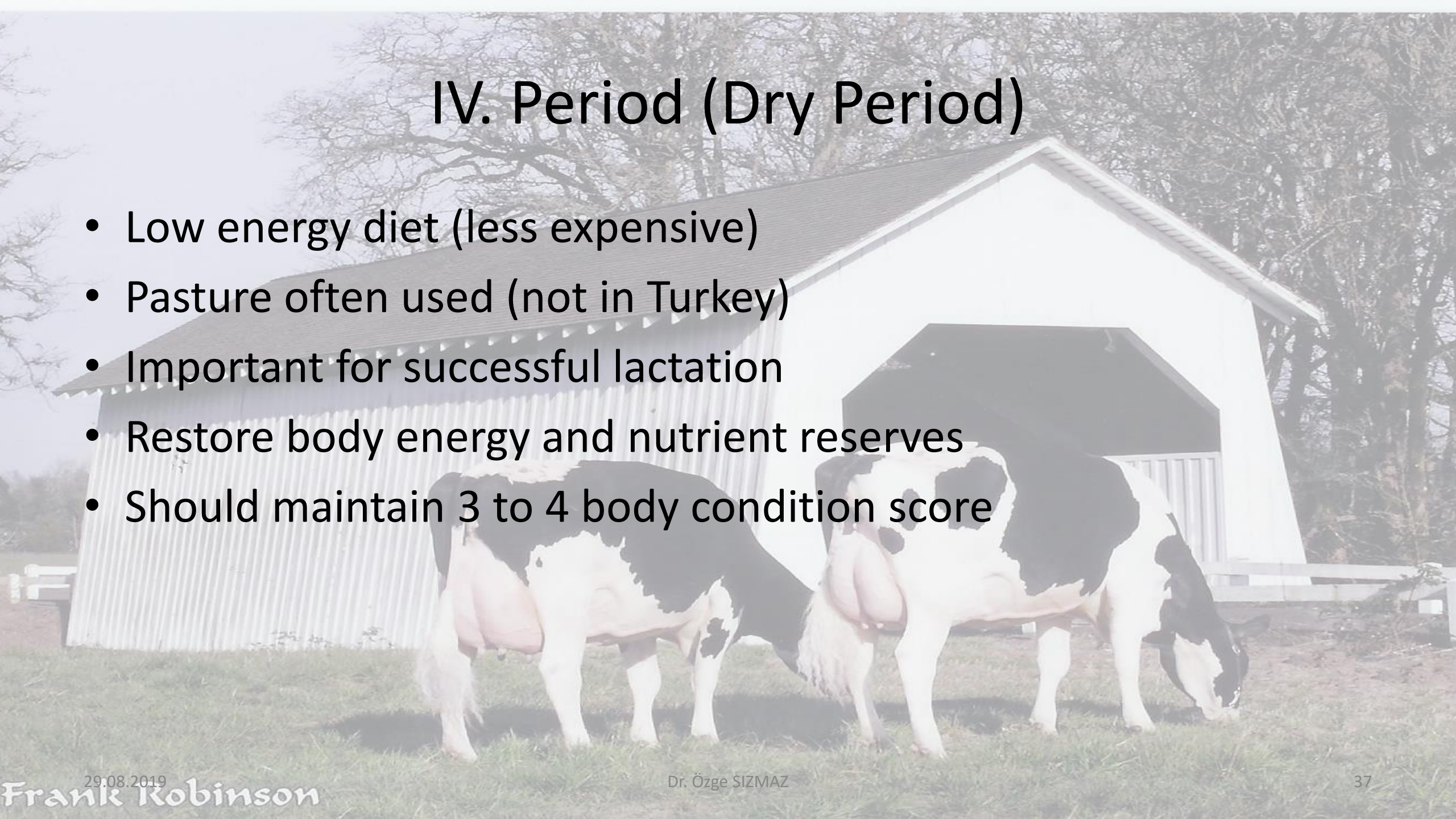
1. The conversion rate of intaken energy to body energy is 82 %.

In other words, feed is evaluated economically. Whereas, this rate is 59% in dry period.

2. Increasing the BW in late lactation period is better than in dry period.

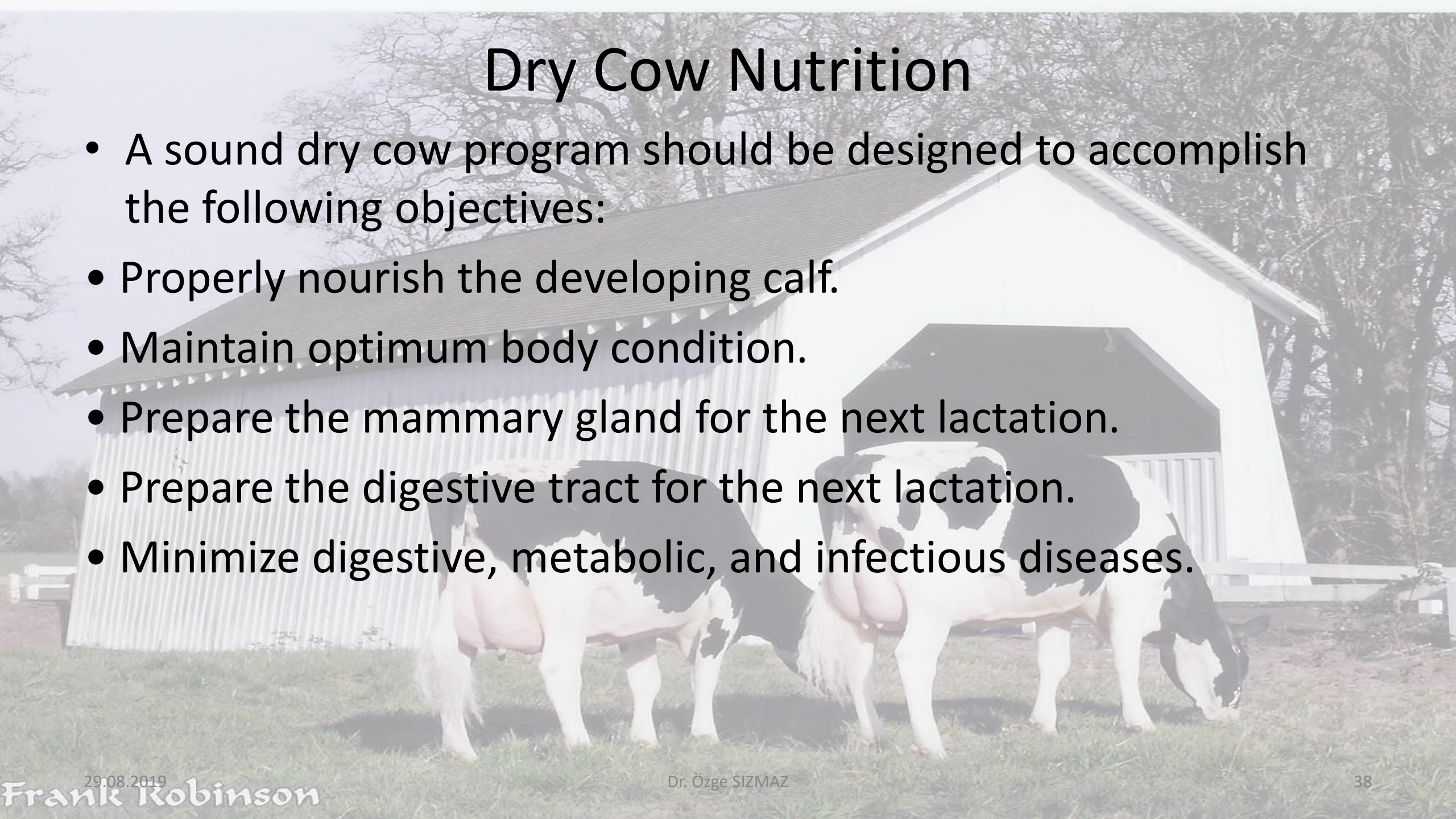
IV. Period (Dry Period)

- Low energy diet (less expensive)
- Pasture often used (not in Turkey)
- Important for successful lactation
- Restore body energy and nutrient reserves
- Should maintain 3 to 4 body condition score



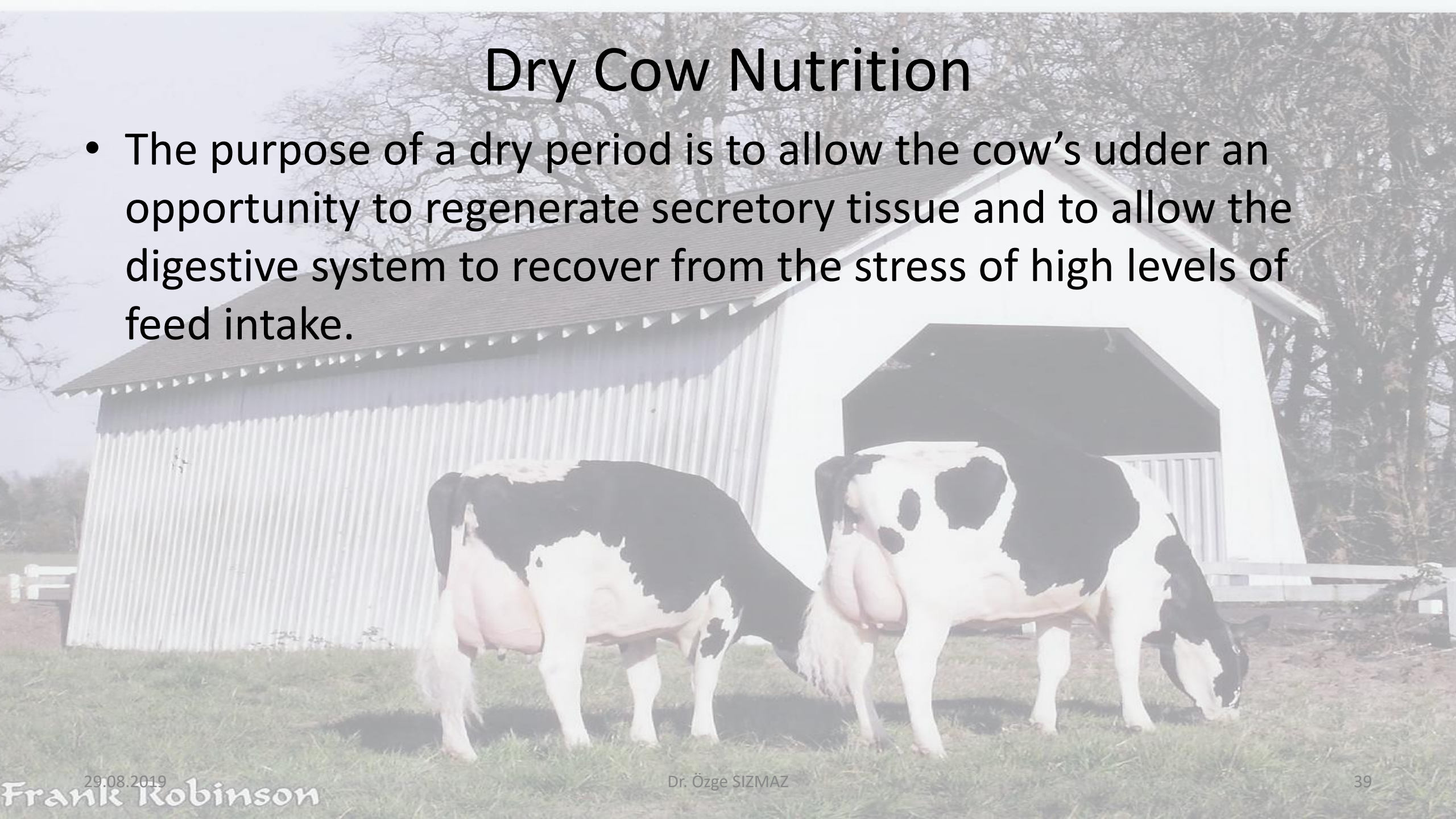
Dry Cow Nutrition

- A sound dry cow program should be designed to accomplish the following objectives:
- Properly nourish the developing calf.
- Maintain optimum body condition.
- Prepare the mammary gland for the next lactation.
- Prepare the digestive tract for the next lactation.
- Minimize digestive, metabolic, and infectious diseases.



Dry Cow Nutrition

- The purpose of a dry period is to allow the cow's udder an opportunity to regenerate secretory tissue and to allow the digestive system to recover from the stress of high levels of feed intake.

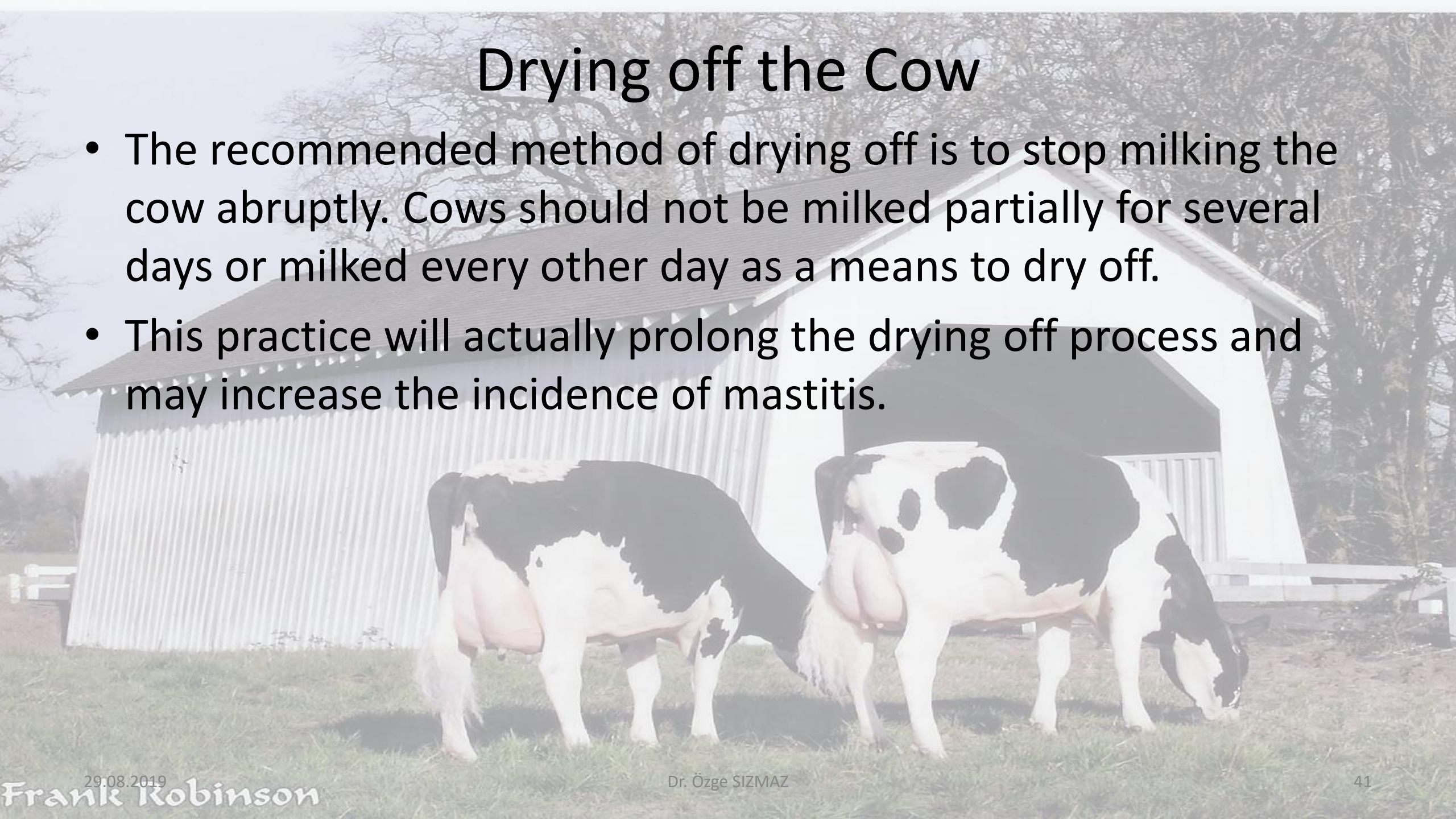


Dry Cow Nutrition

- The optimum length of the dry period may vary from one cow to another. General recommendations are that a 60-day dry period is associated with highest lactation yield. Dry periods less or greater than 60 days results in less production in the next lactation.
- Short dry periods do not allow for adequate udder involution, and long dry periods tend to result in over-conditioned dry cows. The end result in both cases is less milk in the next lactation.

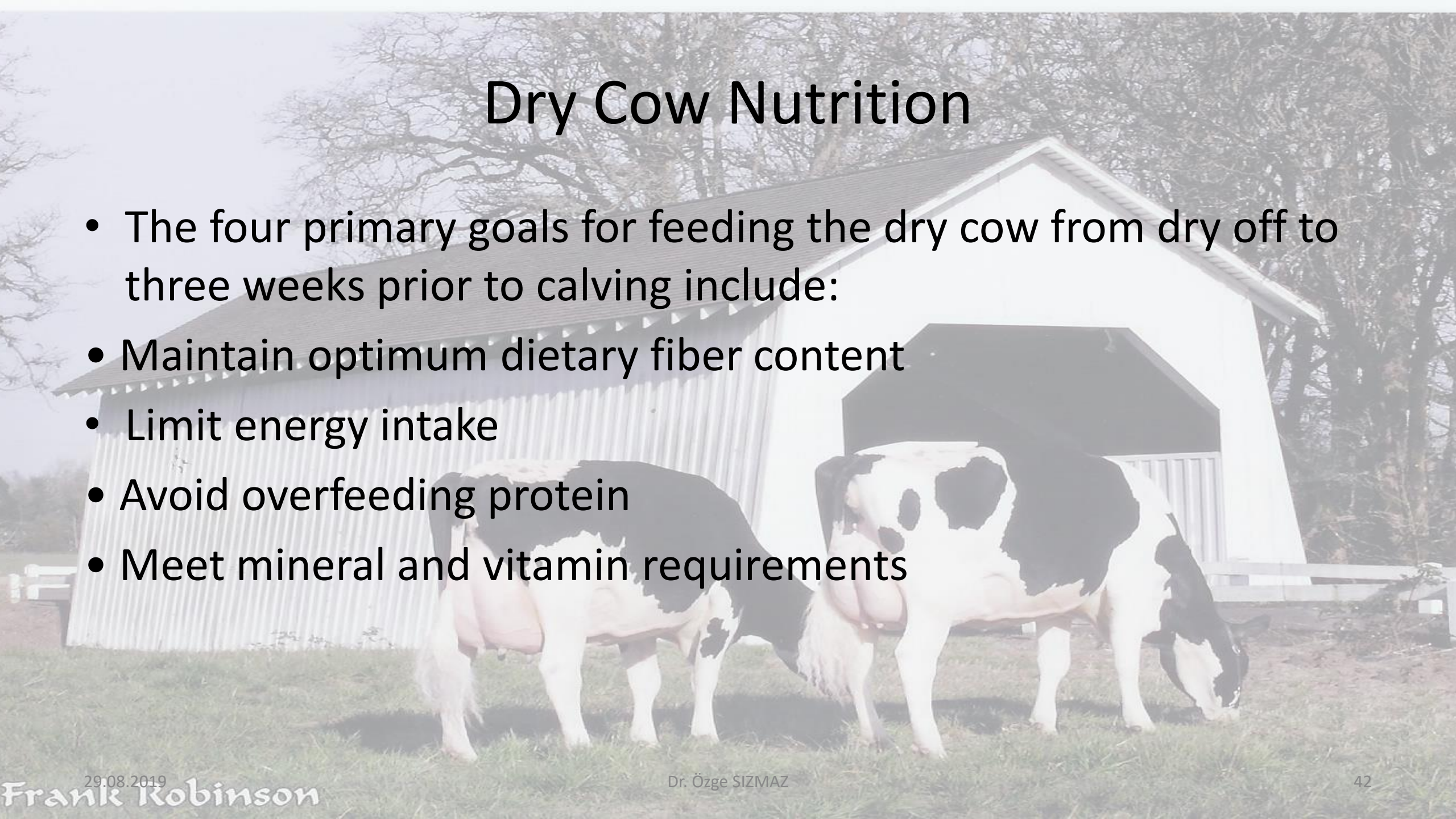
Drying off the Cow

- The recommended method of drying off is to stop milking the cow abruptly. Cows should not be milked partially for several days or milked every other day as a means to dry off.
- This practice will actually prolong the drying off process and may increase the incidence of mastitis.



Dry Cow Nutrition

- The four primary goals for feeding the dry cow from dry off to three weeks prior to calving include:
- Maintain optimum dietary fiber content
- Limit energy intake
- Avoid overfeeding protein
- Meet mineral and vitamin requirements



Dry Cow Nutrition

Dry cows must be separated from the milking herd in order to be fed properly. Additionally, dry cows are best managed in two groups.

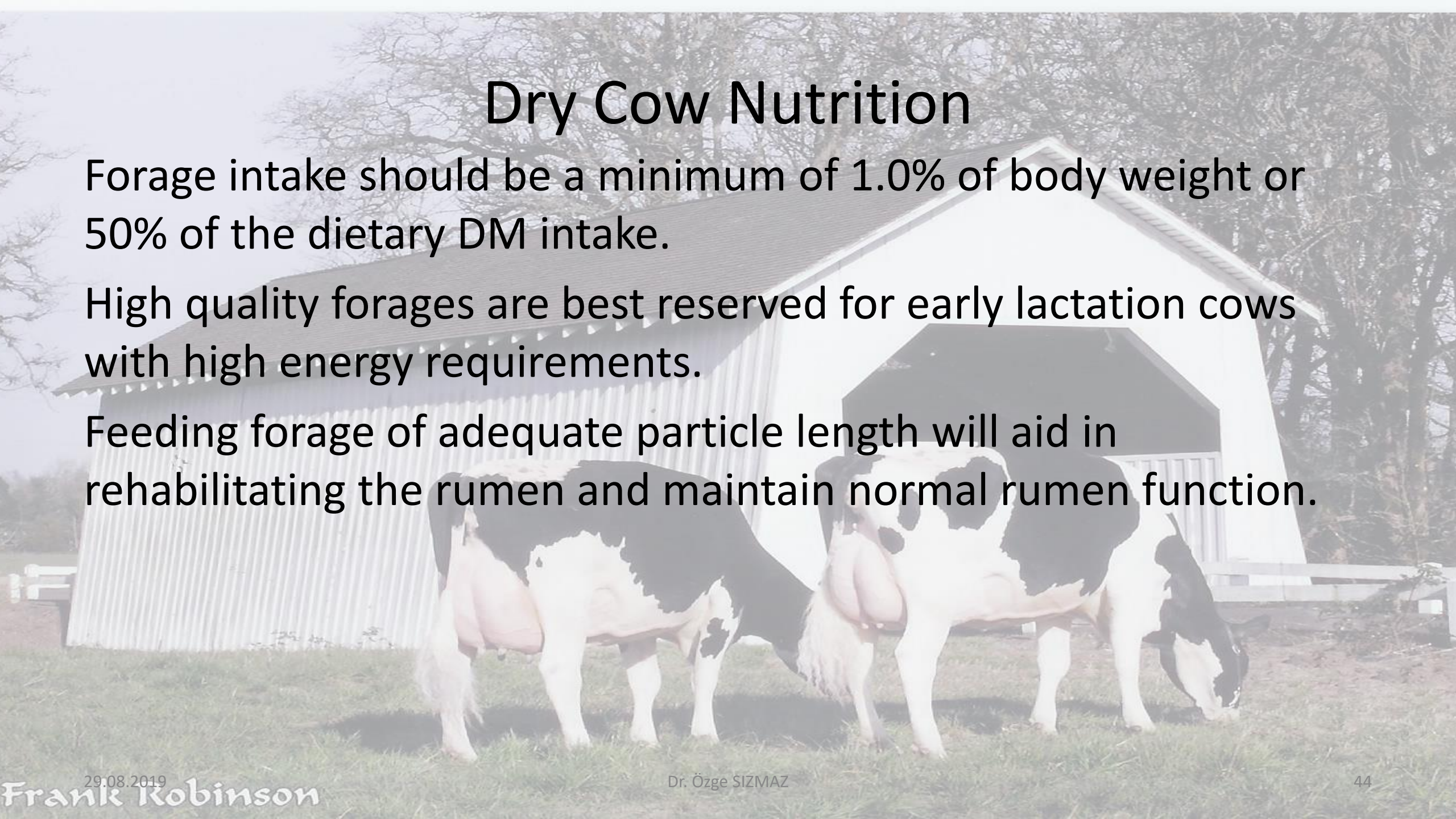
The first group should contain all dry cows except those within two to three weeks of calving. Dry matter (DM) intake by the first group is usually in the range of 1.8 to 2.2% of body weight. Dry matter intake of cows within two weeks of calving decline to about 1.5 to 1.8% of body weight. Due to this decrease in dry matter intake, cows within two to three weeks of calving should be placed on a more nutrient-dense diet in order to meet their nutrient needs

Dry Cow Nutrition

Forage intake should be a minimum of 1.0% of body weight or 50% of the dietary DM intake.

High quality forages are best reserved for early lactation cows with high energy requirements.

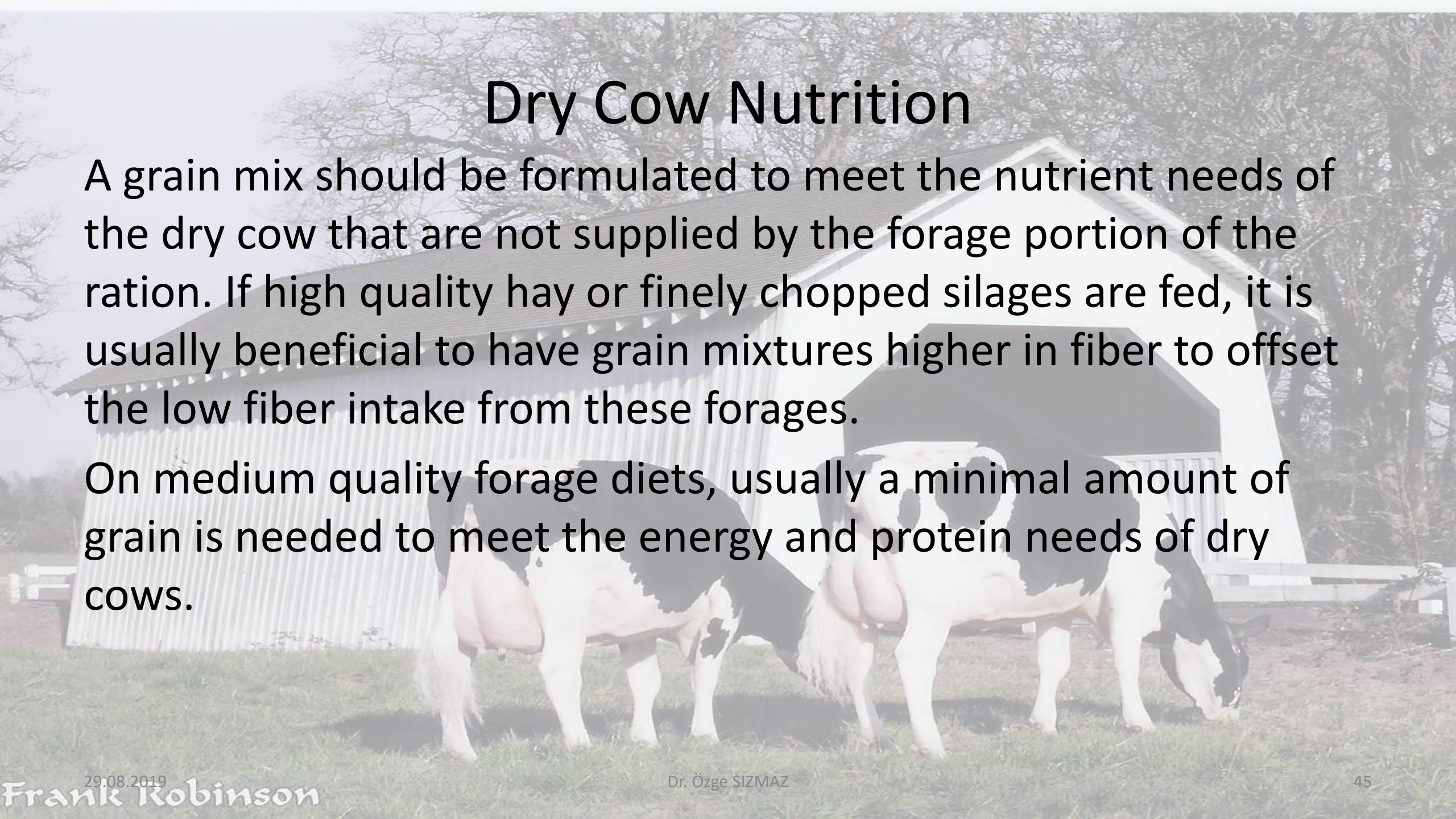
Feeding forage of adequate particle length will aid in rehabilitating the rumen and maintain normal rumen function.



Dry Cow Nutrition

A grain mix should be formulated to meet the nutrient needs of the dry cow that are not supplied by the forage portion of the ration. If high quality hay or finely chopped silages are fed, it is usually beneficial to have grain mixtures higher in fiber to offset the low fiber intake from these forages.

On medium quality forage diets, usually a minimal amount of grain is needed to meet the energy and protein needs of dry cows.



Dry Cow Nutrition

The primary goal when feeding minerals during the dry period is to avoid excessive **calcium** and keep the calcium to phosphorus ratio between 2.0:1 to 1.5:1. The control of calcium and phosphorus is important for the prevention of milk fever.

Additionally, potassium levels greater than 1.5% of the ration dry matter may interfere with magnesium absorption and calcium mobilization, also resulting in milk fever, as well as retained placenta, and downer cow problems at calving.

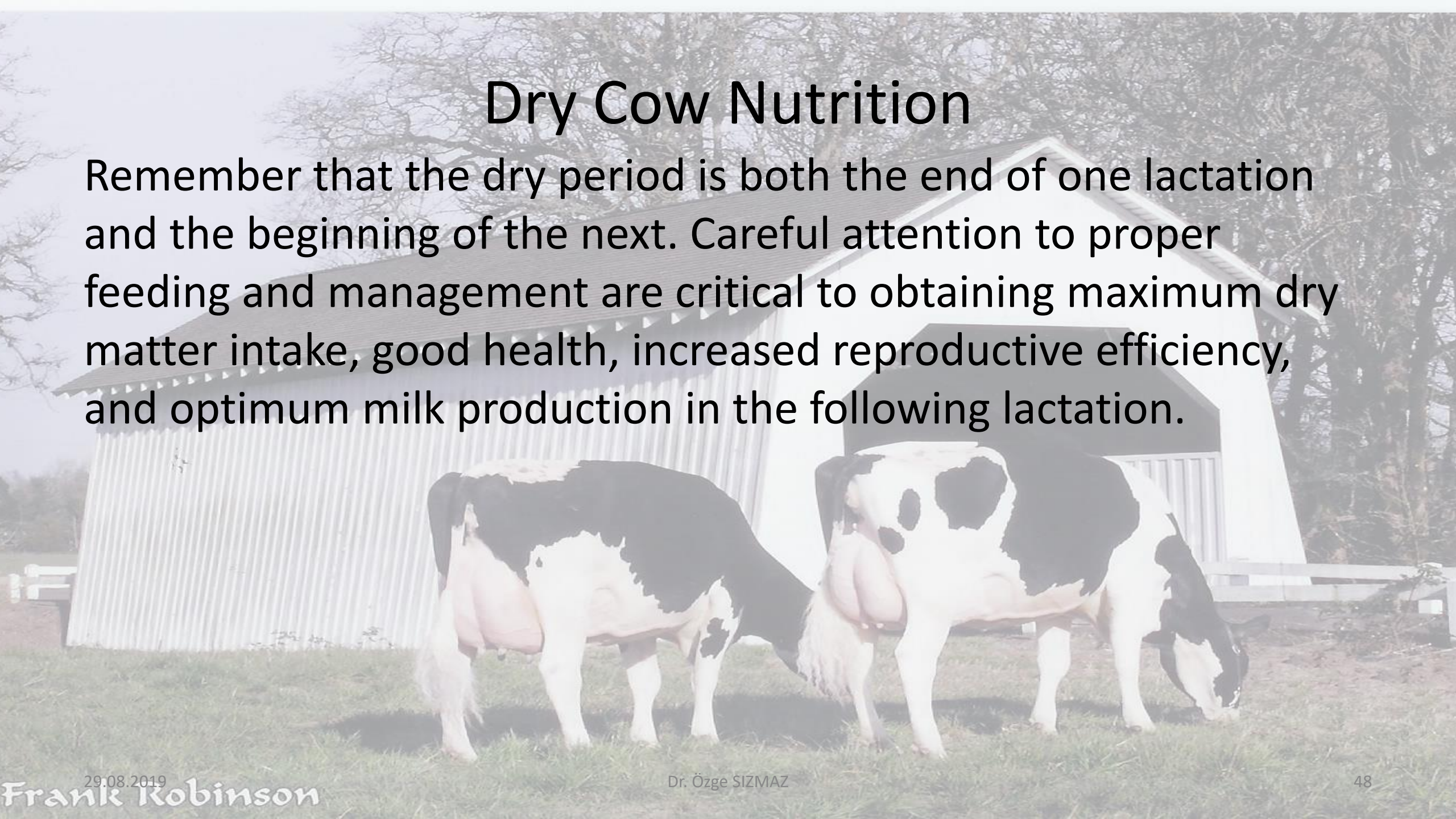
Dry Cow Nutrition

Recommendations concerning management of the dry cow could be summarized as follows:

1. Keep accurate records on breeding and calving dates.
2. Feed cows during late lactation so that they will be in adequate body condition at drying off.
3. Dry off each cow to allow for a dry period of 60 days.
4. Provide enough forage and some grain, if needed, to insure that the dry cow will be in proper condition at calving.
5. Provide supplemental minerals and vitamins as needed for adequate nutrition of the cow.

Dry Cow Nutrition

Remember that the dry period is both the end of one lactation and the beginning of the next. Careful attention to proper feeding and management are critical to obtaining maximum dry matter intake, good health, increased reproductive efficiency, and optimum milk production in the following lactation.



Require of Protein and Energy Level

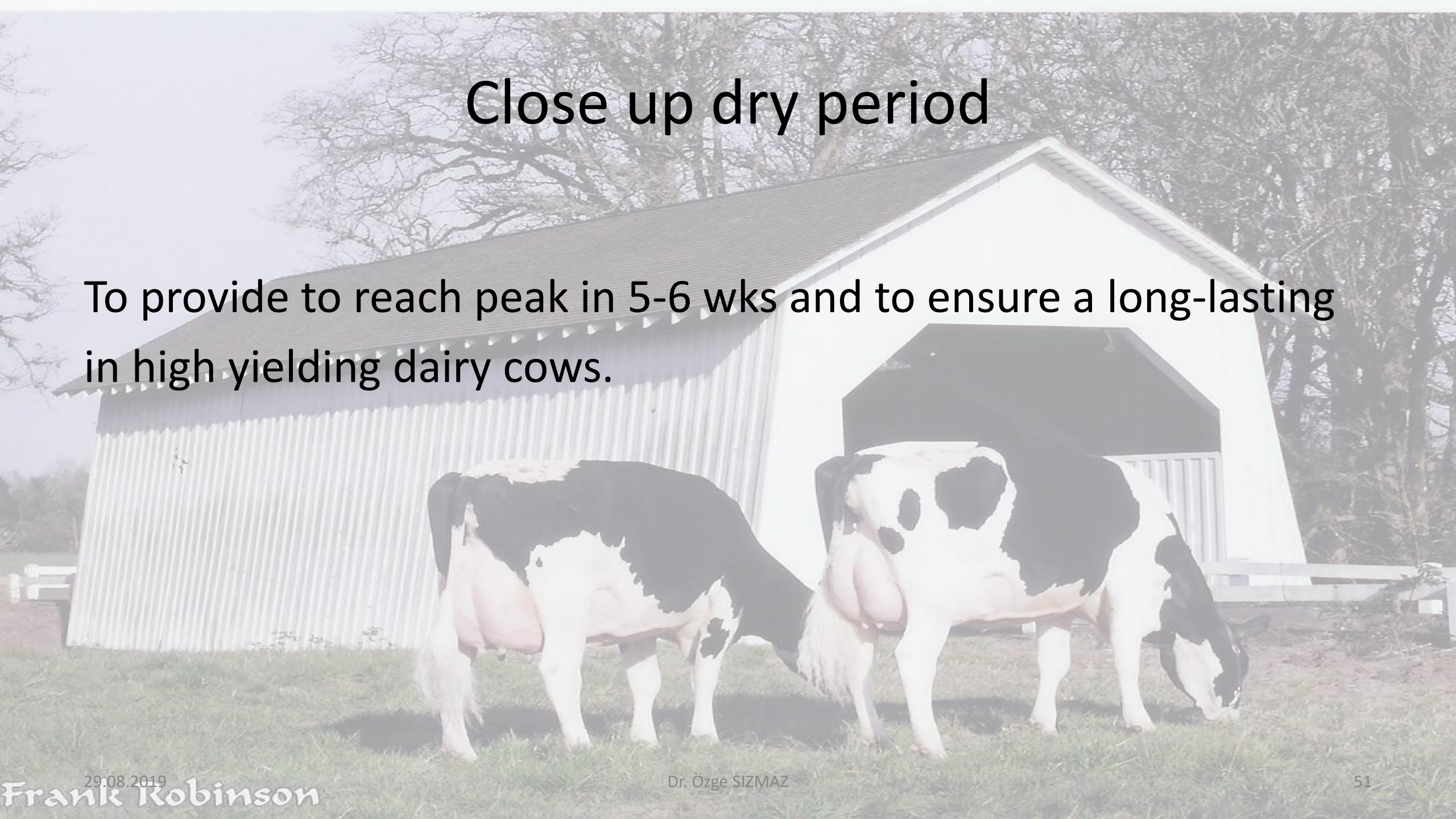
	CP, %	Energy, mcal/kg NEL
I. Period	19	1.67
II. Period	14	1.65
III. Period	13	1.52
IV. Period	12	1.25

Transition Period[last 3 wks of gestation (close up dry period) and first 3 wks of lactation (early fresh period)]

- The term *transition* is to underscore the important physiological, metabolic, and nutritional changes occurring in this time frame. It constitutes a turning point in the productive cycle of the cow from one lactation to the next. The manner in which these changes occur and how they are managed are of great importance as they are closely linked to lactation performance, clinical and subclinical postpartum diseases, and reproductive performance that can significantly affect profitability.

Close up dry period

To provide to reach peak in 5-6 wks and to ensure a long-lasting in high yielding dairy cows.



Early (pre)fresh period

The nutrition and management of the cow during the three weeks before and after calving determine in large part the cow's production for her entire lactation.

During the pre-fresh period, the cow's nutritional requirements increase while dry matter intake decreases.

Nutrient concentration of the ration must increase. The mineral balance of the ration is critical at this time. Also, the rumen microbes and rumen papillae benefit from a gradual adjustment to more concentrates.

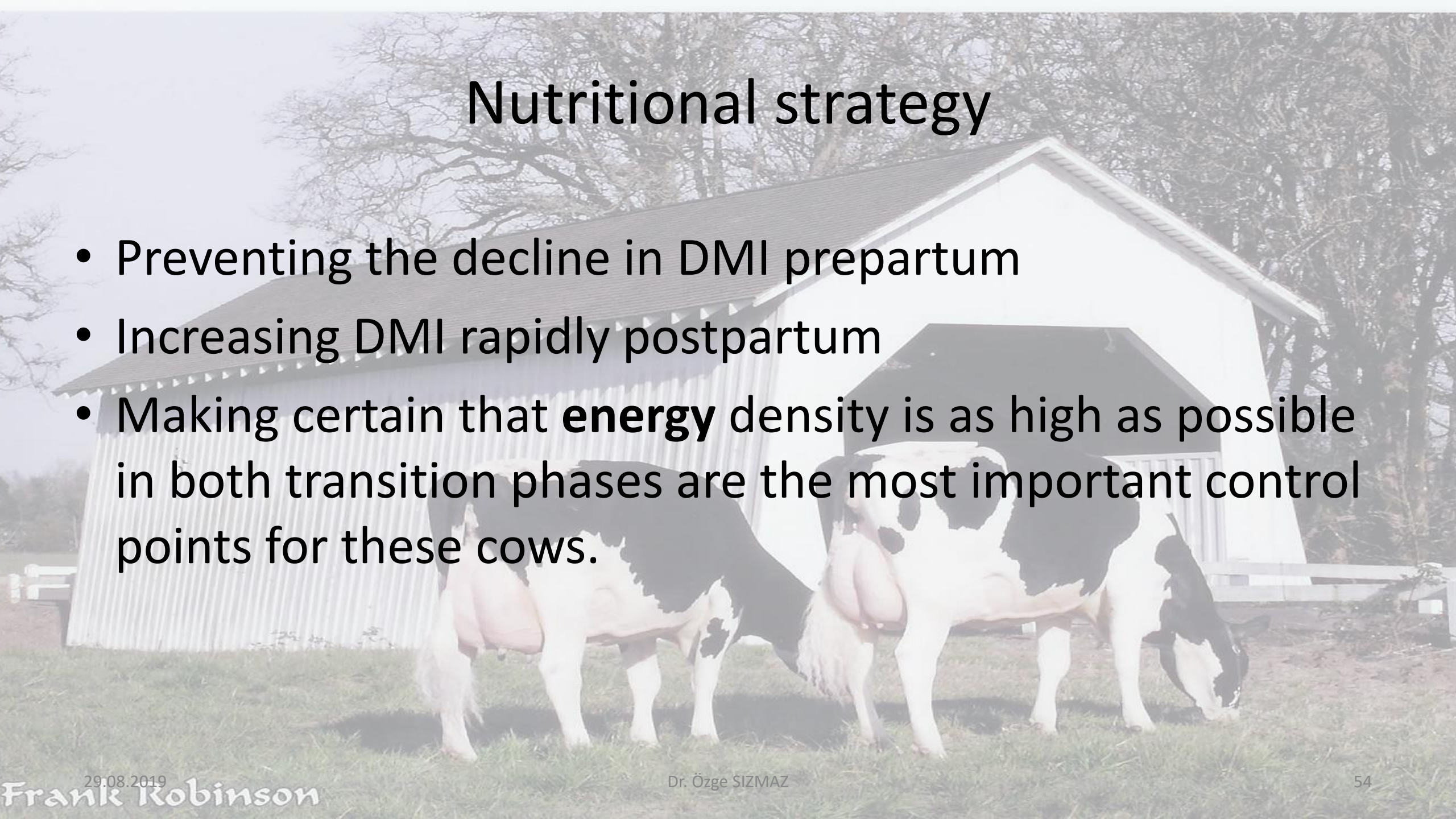
Early (pre)fresh period

There are many advantages of a pre-fresh ration.

1. metabolic problems decrease because of an improved mineral balance. If all dry cows are in one group, it is often difficult to provide the appropriate minerals because of supplement costs and forage inventory.
2. clinical and sub-clinical ketosis is reduced. This is accomplished by increasing dietary energy concentration.

Nutritional strategy

- Preventing the decline in DMI prepartum
- Increasing DMI rapidly postpartum
- Making certain that **energy** density is as high as possible in both transition phases are the most important control points for these cows.



Nutritional strategy

- **Non-Fiber Carbohydrate**
  The level of non-fiber carbohydrate needs to be higher in pre-fresh diets for four different reasons.
- 1. the pre-fresh diet needs to contain a higher concentration of energy. It is usually most economical to meet this need in the form of NFC.
- 2. propionate, a volatile fatty acid (VFA) primarily produced from the fermentation of NFC, increases the length of the rumen papillae.

Nutritional strategy

- The rumen papillae are the finger-like projections that absorb VFA from the rumen. Stimulating their growth prior to calving increases VFA absorption after calving. The VFA are used as an energy source for the cow and propionate is specifically needed to reduce ketosis.Elimination of rumen acids is also important for controlling rumen acidosis.

Nutritional strategy

- 3. higher NFC levels help to transition the rumen microbes towards a lactating ration again. Increasing the growth of the NFC-fermenting microbes before calving will further reduce the incidence of acidosis and “off-feed” problems once the cow calves and consumes a diet with more NFC.

Finally, propionate is used to derive energy from body fat and reduce ketosis

Nutritional strategy

- Non-fiber carbohydrate levels need to rise to 32-33% of the dry matter during the pre-fresh period.
- As with milking cow diets, it is important to provide a blend of NFC sources, some which ferment fairly rapidly (such as sugars and high-moisture corn) and some that are more slowly fermented (such as cornmeal).
- This will increase overall digestion of NFC, the number of rumen bacteria, and the amount of rumen microbial protein available for use by the cow.

Nutritional strategy

- The forages in the ration must be fresh and mold-free.
- Do not use the sweepings from the milking cows as part of the pre-fresh ration.
- Do not feed the pre-fresh TMR every other day. Have fresh TMR available at least once per day, better yet, twice per day.
- Never let the pre-fresh bunk remain empty during the day. 10% refusals are recommended. Be careful to minimize and gradually introduce anionic salts, bypass fats, and animal proteins that are not very palatable. Include forages to be fed in the milking ration in the pre-fresh ration to minimize adjustment after calving.

Anion-Cation difference in rations (DCAD)

-Na

-K

-Cl

-S

mEq/kg DM

In Lactation = cationic = +300 +400 mEq

In dry period = anionic = -100 -150 mEq

Negative DCAD == acidic ration

Positive DCAD == alcaline ration

DCAD = 0 == balance of anion cation

BCS

- Using body condition scoring to fine tune herd nutrition and health management has become a widely accepted practice.

- BCS at calving
  - < 2.75 ➡ reduced milk yield
  - > 3.25 ➡ reduced milk yield

- BCS change after calving
  - Decrease of 1 BCS unit ➡ increase of 930 lb milk in 305-d lactation
  - Body reserves essential to support milk production

- 1 lb=0.45 kg

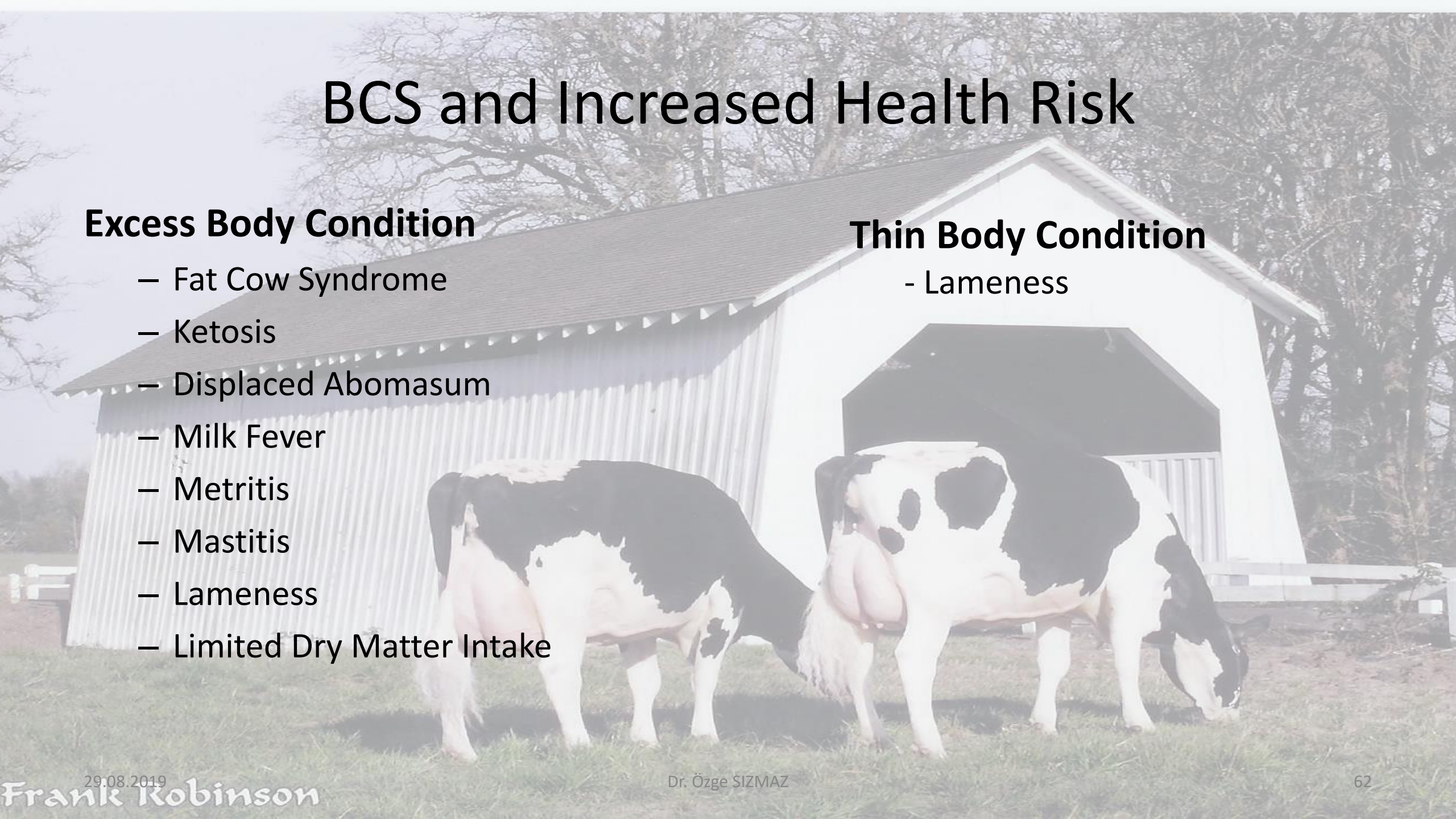
BCS and Increased Health Risk

Excess Body Condition

- Fat Cow Syndrome
- Ketosis
- Displaced Abomasum
- Milk Fever
- Metritis
- Mastitis
- Lameness
- Limited Dry Matter Intake

Thin Body Condition

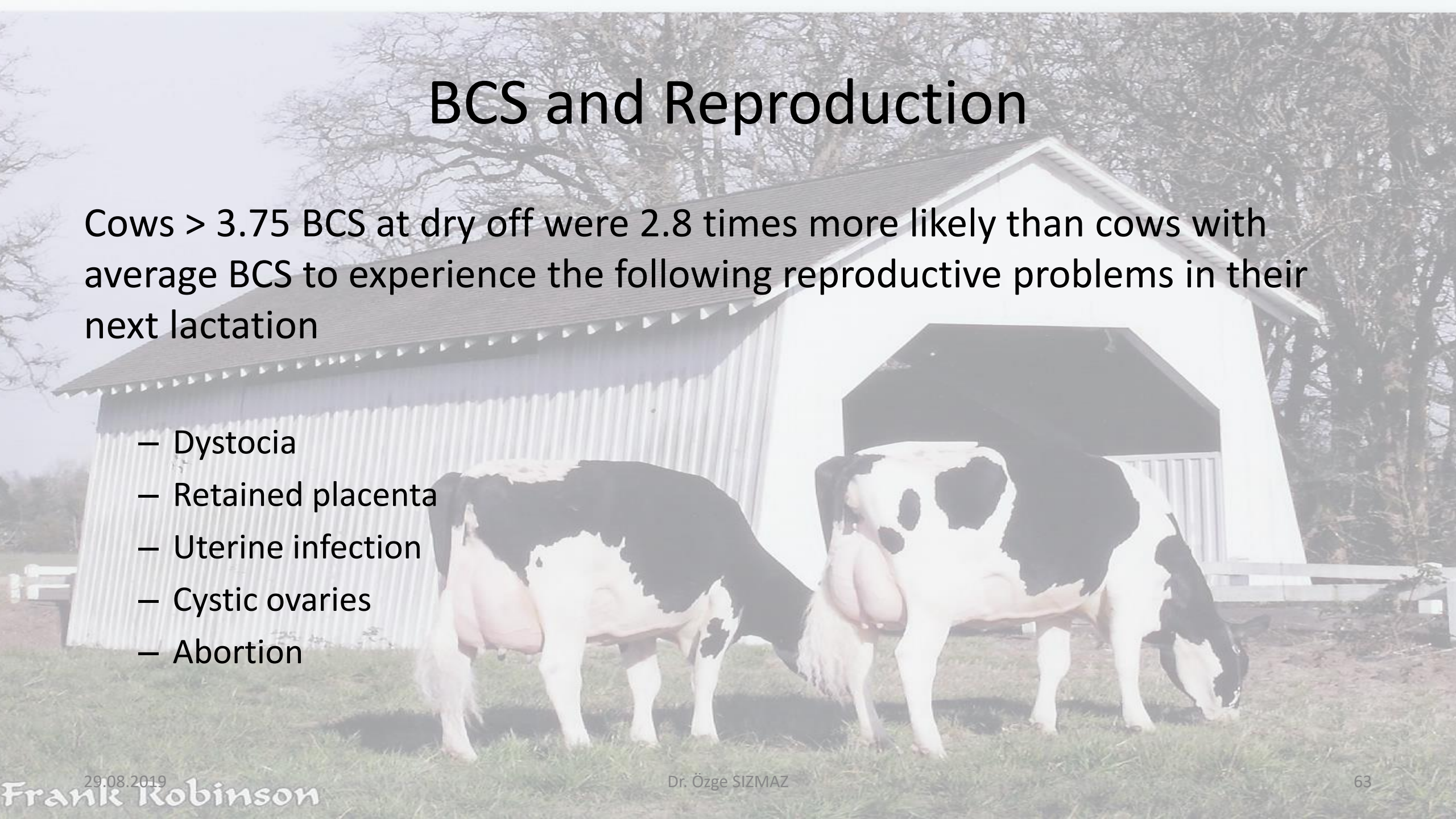
- Lameness



BCS and Reproduction

Cows > 3.75 BCS at dry off were 2.8 times more likely than cows with average BCS to experience the following reproductive problems in their next lactation

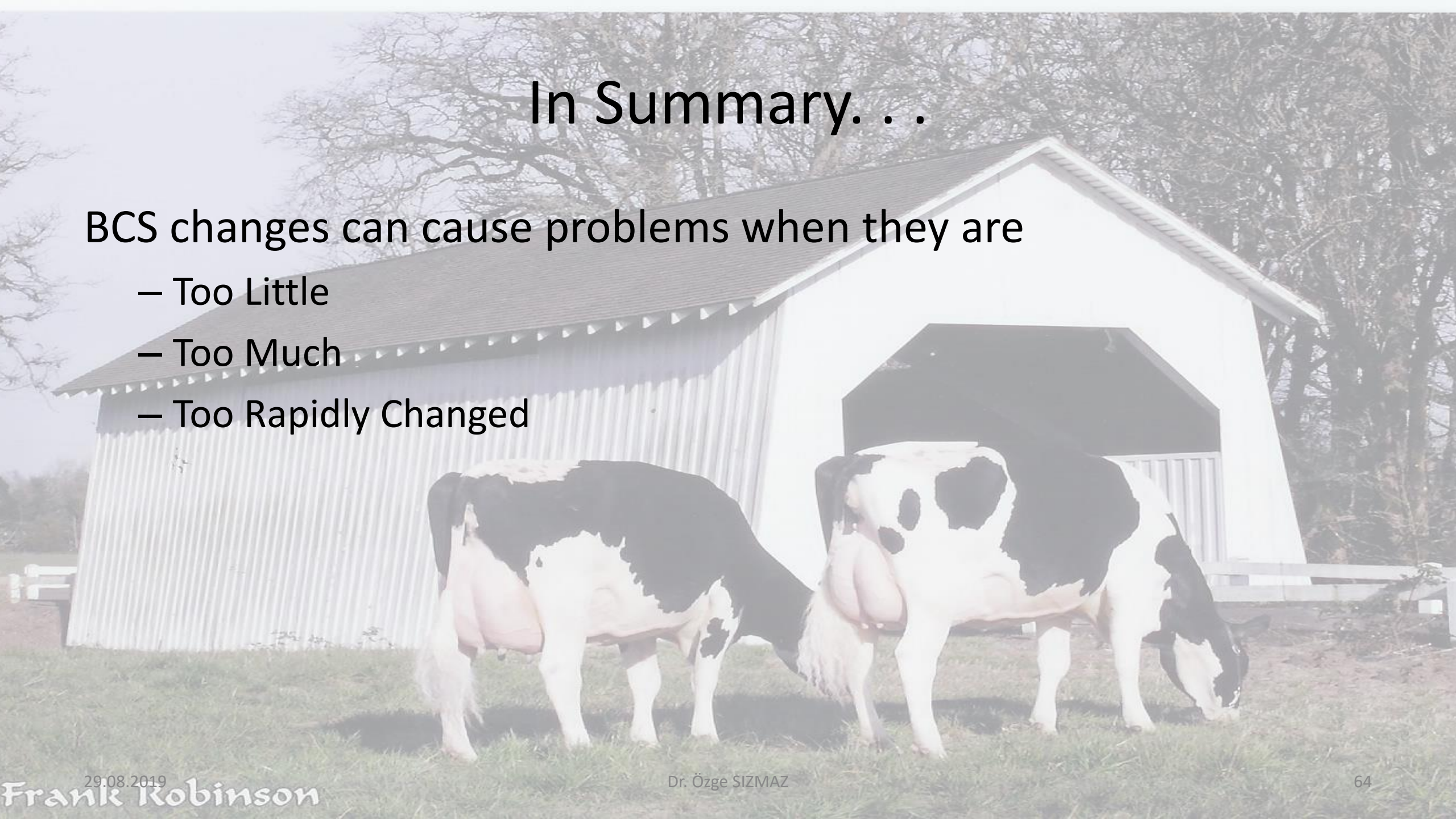
- Dystocia
- Retained placenta
- Uterine infection
- Cystic ovaries
- Abortion



In Summary. . .

BCS changes can cause problems when they are

- Too Little
- Too Much
- Too Rapidly Changed



Dairy Cow Nutrition

- Cow nutrition is important in order to be profitable in the dairy industry from growth of the calves through milk production in lactating cows.