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Life Performance - The "Natural Selection Index"

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Relationships between cow and grass

Indispensable prerequisites for human life are green plants and natural soil fertility. Even in ancient times, the Greeks knew that earth, water, air and fire (sun) are the four elements of life. For the utilization of grassland yields and raw fiber-rich by-products of farmland, "ruminant stomach" as a fifth element of life is also indispensable. Of the total land surface of the earth, two thirds are forest and wasteland, only one third is used for agriculture. Two thirds of this is grassland and only one farmland.

From an ecological point of view, the ruminants are particularly noteworthy because they can use the stored solar energy of grasses, legumes and herbs through the highly specialized forestomach system using microorganisms. For the organic farm, the legumes are also indispensable nitrogen collectors and for the cattle they are excellent forage plants. The peculiarity of the "grass eater" is therefore due to the fact that they are not in food shortages (= grain shortage) food competitors of humans, as can be the case for pig and poultry as "grain eater".

The agricultural livestock species differ not only in the different feed claims, but also in their effectiveness to convert feed materials into food. From 1,000 g of feed protein from cows weighing 20 kg per day, about 270 g of milk protein are obtained, from a fattening bull only 110 g of meat protein. Milk production is therefore at least twice as effective as cattle fattening (Haiger 2005).

The grassland is a permanent crop with 40 to 60 different plant species compared to the arable crops - especially the maize monoculture - an excellent erosion and groundwater protection and is exceeded in terms of natural soil fertility only by a horticultural composting (if a straw sure cattle manure is available). However, these benefits of grassland are lost if excessive biodiversity (eg more than 700 kg of feed per cow per year) drastically reduces biodiversity and leads to severe weed transmission (manure flora).

As a dairy or suckler cow for the grassland areas, cattle have a further ecologically and economically indispensable significance as "keepers" of the cultural landscape. In the country-steeped areas, the rich green of the meadows, the colorful flowers, the peacefully grazing cows and the rural settlements are what people in need of rest are looking for. The conclusion of an international congress in the mountain area was therefore: "First the cow goes, then comes the forest and comes this in excess, so goes also the man."

What adverse effects it has on the "health value" of milk and meat from ruminants, when more and more grass is displaced from the feed ration for economic reasons, shows the fat composition. The rumen microbes also have the ability to produce essential (essential) fatty acids for humans, which are stored in the fat of the milk and meat. Numerous scientific papers from the last decade have shown that in grazing or hay-grass silage feeding in comparison to maize silage concentrate, the content of these unsaturated fatty acids is much higher and the ratio of omega acids clearly positive (Haiger 2005).

Milk-stressed cows without concentrated feed?

From an economic point of view, breeding for higher performance is the most effective measure to save on fodder, labor and housing costs. Because with increasing power, the energy requirement per kilogram of milk decreases, as the constant maintenance requirement is distributed over more milk kilograms. The decrease is the lower, the higher the power increases. Despite higher feed intake with higher milk yields and cow weights, the proportion of concentrated feed in the ration increases disproportionately. For ecological reasons (nitrogen balance), therefore, depending on the level of basic forage consumption and cow weight, the responsible livestock averages between 5,000 and 7,000 kg for grassland and between 500 and 800 kg for arable crops (maize silage, own feed grain) (Pfeffer and Spiekers 1989, Pfeffer 1997, Dietl and Lehmann 2004).

Almost all feeding experts and practitioners, however, argue that highly-prone dairy cows will only stay healthy and fertile if fully fed, requiring a high level of concentrates in addition to the basic feed. In the long term, however, it would be an ecological nonsense to breed ruminants, which could not exist without concentrates and in times of energy shortages (= power supply shortages) would inevitably become food competitors of humans. In two 10-year trials, we therefore looked at the question of what high-yielding cows afford and how feeding without concentrates would affect fertility and longevity (Haiger and Sölkner 1995, Haiger and Knaus 2010). With regard to health (veterinary costs), fertility (insemination index) and longevity, there was no significant difference between the cow groups with and without concentrates if the basic feed (grass, hay and silage) was given in sufficient quantity (= long feeding times). Taking into account the clear superiority in performance of dairy cows (Holstein

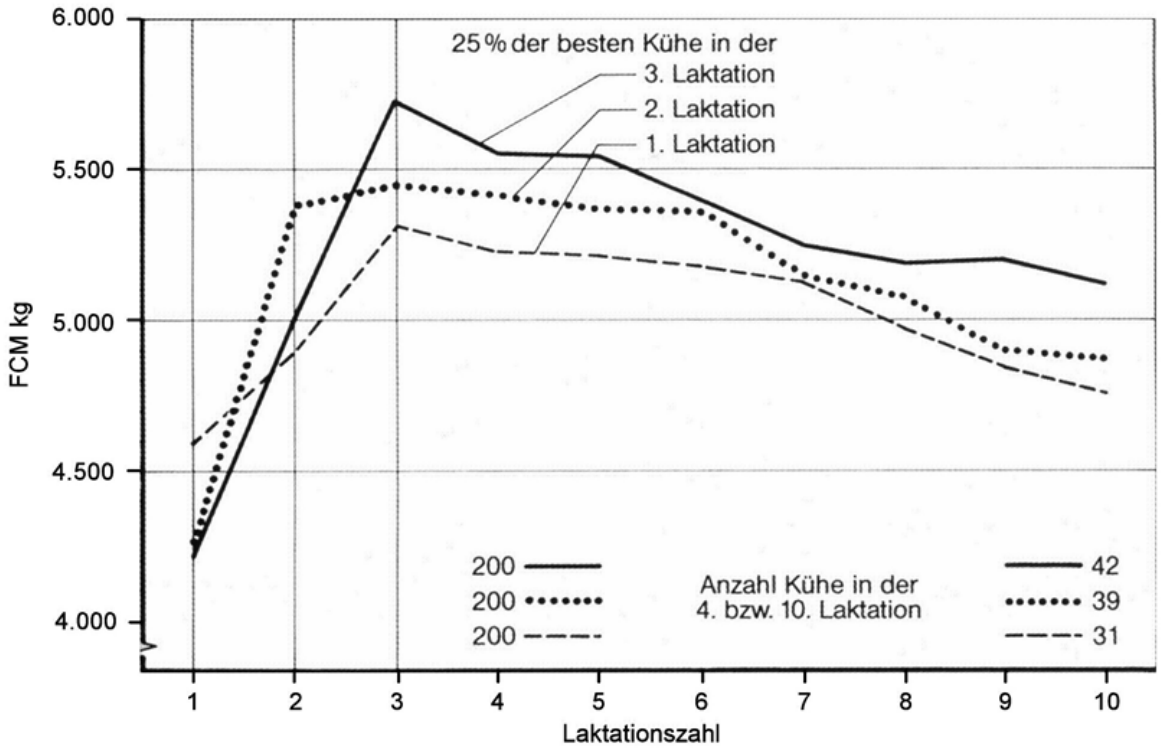
Friesian and Brown Swiss) over combined (Simmental and European Braunvieh) of about 10 to 20%, the former would produce milk more cheaply even in shortage of concentrate.

Prematurity - late maturity

If one applies the biological principle of Brody (1945) to dairy cows, then it is to be expected that cows with higher lifespan will be mature at maturity and reach their maximum performance only in higher lactations. Sometimes it is also argued that the useful life is not a suitable selection criterion, because it is not present until the animals have left. However, in an economic-genetic study Eßl (1982) could show that one does not have to wait for the last lactation, but from the third lactation a good estimate for the expected milk life performance has (see picture).

From 800 Fleck and Brown Swiss cows, which yielded at least four lactations, the 200 cows each, or 25% after the highest first, second and third lactation respectively, were selected and their performance was calculated in the follow-up lactations. The quarter of the most precocious cows with the highest first lactations increased least in the following lactations and were clearly inferior from the second lactation to the later ripening cows - with the higher second and third lactations. The default rates were higher. So in the 10th lactation only 31 "precocious" but 42 "late maturing" cows were present - that is one third more. The Erstlaktation is therefore only suitable for excretion of the worst cows; it should be seen as "training lactation" and not "fueled" with concentrated feed. The final selection decision can only be made from the 3rd lactation. For the selection as a bull

Folgen der Selektion aufgrund der ersten drei Laktationen
(Eßl 1982)



mother should have at least 5 above-average lactations, because then you know much more about udder seat, foundation, fertility, birth, constitution, milkability, persistence, character ... The breeding goal corresponds to cows, which from the 3./4. Lactation in the fat-protein amount about about the same age and equal weight stable mates are (deduction for maintenance per 100 kg extra weight around 700 kg of milk or 50 kg fat protein), as Haiger (1973) and Steinwidder (2009) have proposed.

Milk - meat

Attempting to combine high milk yield and high meat intake in the cow, harmful intervention in vital control circuits (Haiger 1985). Some show cows, selected from thousands, can not be considered counter-proof, but must be considered as exceptions to the rule. However, it should not be selected "against meat" (= Dairy-type), as is common especially in North America and has now been adopted by all so-called high-breeding countries, although the adverse effects on the useful life or profitability of milk production have been proven many times are (eg Rogers & Ma 1999).

Cow families

Until a few decades ago, the general opinion in biology was that hereditary (DNA) structures occur only in the nucleus. Today, there is no doubt that mitochondria also have specific genetic material that can account for up to 10% of total genetic information. The mitochondria are embedded in the cytoplasm, which is why cytoplasmic or mitochondrial inheritance is used in this case, in contrast to the chromosomal genetic factors in the cell nucleus. After the energy metabolism takes place in the mitochondria ("power plants"), these genes have a vital control function for all metabolic activities of a cell. The special feature of the inheritance of these mitochondrial genes lies in the fact that they are passed on only through the oocytes, as of a sperm cell (sperm) during fertilization, only the head (= nucleus) penetrates into the egg. The maternal cell nucleus then merges with the paternal to the fertilized egg cell (zygote), while the entire remaining cell is of purely maternal (maternal) origin.

A population genetic analysis in Austrian Fleckvieh (Eßl and Schnitzenlehner 1999) showed virtually no cytoplasmic (mitochondrial) influence on the milk performance characteristics, but very much on the service life and service period, somewhat less on persistence. For the fitness traits (ND, PER), the cytoplasmic similarity between grandmother and granddaughter is significantly higher than the cell nucleus-related.

Although these cytoplasmic (mitochondrial) gene effects are not passed on by the bulls, it is to be assumed from a biological fundamental consideration that between the amount of energy provided in the mitochondria (power plants) and the performance of important organs such as lungs, liver, Digestive tract or udder, which is based on chromosomal genetic factors, there is a positive interaction (feedback). Because in an organism, everything is connected with everything (loop principle).

Breeding strategies

Conventional breeding strategy (= unnatural)

In the conventional breeding value estimation (GZW in Austria, RZG in Germany) the Although the first three lactations were calculated separately, they were again averaged, although by Eßl (1985) proposed a weighting of 0.25: 0.30: 0.45 for the 1: 2: 3rd lactation and also in the practical breeding value estimation of Austria some years was used. Because these weight factors correspond to the increase in performance of long-lasting, continuous-yielding cows, which only have their maximum after the 5th lactation. In contrast, the weighting of the first three lactations in the ÖZW (Postler 2006) of 0.1: 0.2: 0.7 seems too differentiated.

If dairy cows are primarily used to convert feed into food and energy is the common denominator of various forms of matter, then logically, it depends on the amount of energy delivered to the milk and not on the fat or protein content (Bakels et al. Bauer 1958). The most accurate measure of the amount of energy in a cow's milk yield is FCM or ECM performance; they give the energy-equivalent milk yield of a cow with 4% fat or 3.4% protein. In practice, the added amount of fat and protein is a useful value for the selection decision. Nevertheless, in Austria and southern Germany (FV, BV), the total weight of the fat and protein was weighted at a ratio of 1: 4 and 1:10 respectively for 20 years. In Northern Germany (HF) the fat protein quantity is still weighted at 1: 4 and additionally the protein content gets ten times the weight.

In this context, the following facts still have to be pointed out. All low protein mammalian species are late maturing, that is, they grow slowly and live much longer than those with a high protein content that grow faster and live shorter.

Alternative breeding strategy (by nature)

Based on the discussions so far, the following procedure is recommended by the Association of Austrian Life Achievement Breeders (AöLZ) for bull selection (Haiger 2005):

1. Cow families with high lifetime benefits, delivered in many lactations
2. ZW for Fitness (ND, PER, ZZ)
3. ZW for fat and protein quantity 1: 1, corrected to weight
4. ZW for meat performance is secondary

The first and most important selection criterion is the cow family, in which high lifetime benefits occur frequently! If a breeding bull later has a breeding value estimation (ZW) based on daughters who have completed three lactations or more, is ranked first by the fitness (longevity, persistence, cell count) and within such bulls according to the milk-breeding value (fat and protein quantity 1 : 1, corrected to the same weight). Meat value is not given much importance in dairy cattle breeding.

Summary

Since the man keeps pets, he has changed them breed, whereby the farm animals were improved in particular in their performance predisposition. However, what happened in the last 50 years with the dairy cows with regard to concentrated feeding and one-sided milk production breeding is highly unnatural to animal welfare relevant. The enormous increases in performance through excessive use of maize silage and / or concentrated feed and breeding for precociousness is offset by a radical decline in the useful life of infertility and diseases (rumen acidosis, abomasal displacement, laminitis ect.).

However, the criticism is not fundamentally directed against the selection for a total breeding value (GZW in Austria, RZG in Germany), but against the way in which it is currently calculated and used without criticism. After all, responsible performance breeding meets biological and ecological limits if fertility and vitality (fitness) are negatively affected and the feeding of "food" in the foreseeable future will no longer be possible due to the plate-trough-tank competition.

Convincing evidence for the practical success of a consistent breeding for life performance is provided by the worldwide "Interbull data". Of the 78,144 HF bulls of the birth years 1960-2000, the following 5 bulls from the life performance lines according to F. Bakels occupy the first 5 places during their useful life: Barbarossa, Baron, Cadillac, Elias and Primstar (Simon 2015).

Bibliography

1.Bakels, F. and H. Bauer (1958): The problem of the genetics of milk production. Breeding hygiene, 2, 329 - 334.

2.Brody, S. (1945): Bioenergetics and Growth. Reinhold, New York.

3.Dietl, W. and J. Lehmann (2004): Ecological meadows. Austrian. Agricultural publisher, Vienna.

4.Eßl, A. (1982): Investigations on the problem of a life-time achievementBreeding in dairy cows. Breeding customer, 54, 267-275 u. 361-377.

5.Eßl, A. (1985): Working paper for the breeding value estimation of the ZAR.

6.Essl, A. and S. Schnitzenlehner (1999): Field data analysis of cytoplasmic inheritance of dairy and fitness-related traits in cattle. Anim. Sci., 68, 459-466.

7.Haiger, A. (1973): The breeding goal in cattle. Anniversary letter for Prof. Dr. med. F. Turek, University for soil culture Vienna.

8.Haiger, A. (1985): Breeding goals between the market and biology. Festschrift "10 years Applied Animal Physiology ", Witzenhausen, Gesamthochschule Kassel.

9.Haiger, A. and J. Sölkner (1995): The influence of different feed levels on the Lifetime achievement of combined and milk-stressed cows. Breeding customer 67, 263-273.

10.Haiger, A. (2005): Natural animal breeding in cattle and pigs. Austrian. Agricultural publisher, Vienna.

11.Haiger, A. and W. Knaus (2010): Comparison of Fleckvieh with Holstein Friesian in the Milk and Meat yield. 1. Communication: Milk performance comparison without concentrated feed. Breeding customer, 82, 131-143.

12.Pfeffer, E. and H. Spiekers (1989): Nitrogen Balance in Dairy Farms. The Animal Breeder, 41, 246 - 247.

13.Pfeffer, E. (1997): Nutrient balances in different feeding systems. Archive for Animal Breeding, 40, 287-294.

14.Postler, G. (2006): Ecological Overall Breeding Value (ÖZW) in Dairy Farming. Austrian. Symposium for Organic Farming, HBLFA Raumberg Gumpenstein, 21./22. March 2006.

15.Rogers, G.W., G. Banos and U. Sanders (1999): Genetic correlations among protein yield, productive life and type traits from USA and diseases in Denmark and Sweden. J. Dairy Sci., 82, 1331-1338.

16.Simon, G. (2015): Personal communication.

17.Steinwidder, A. (2009): Model calculations on the influence of the live weight of dairy cows on Feed efficiency and concentrate requirements. 10th scientific conference on organic farming,Zurich.