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QUALITATIVE GROWTH

Sustainability and productivity in grassland management

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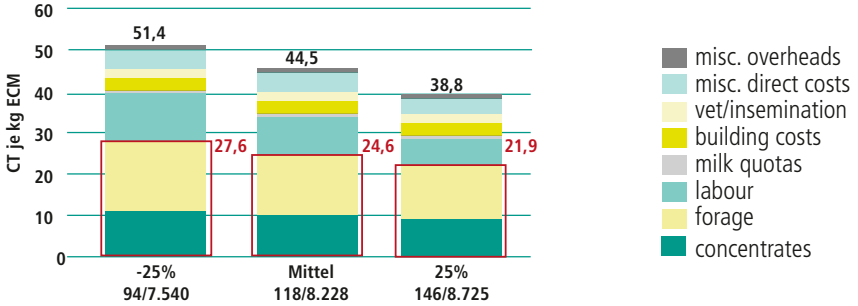
With low milk prices for the past year-and-a-half prompting many dairy farmers to fear for the future of their farms, there is much debate about the dairy industry's prospects. In the long term, sales prospects and the potential for milk and dairy products look positive in the light of a growing global demand. But with or without market quotas – milk pricing reacts extremely sensitively to over and undersupply. In this respect dairy farmers must adapt to the predicted volatility in the milk market. This naturally begs the question of what milk price future production and investments can be based on and what level of intensity is sustainable, especially in grassland-based dairy systems. The intensity of grassland management is subject to local restrictions on land and fertiliser use. In addition, the German Fertiliser Ordinance and associated requirements of the Water Framework Directive stipulate limits for stocking densities on grassland.

Fig. 1: More efficient farms get higher milk yields from the forage



Source: Full cost analysis 2012/2013; Production costs of 1114 RSB farms 2012/2013; Thomsen 2014)

Expand or die?

Economic pressures in the dairy industry have resulted in an enormous growth in the size of some farms, especially in regions where milk production is increasingly being consolidated as a result of farm mergers. Expand or die is the current catchphrase in dairy farming. This has led to a growing shortage of both arable and grazing land and consequently to a substantial rise in land prices. Rising land costs in turn lead to more intensive farming. However, this is only economically and environmentally tenable if it generates an adequate increase in productivity in terms of output and quality; besides, only if re-

sources such as energy, nutrients and expertise are used more efficiently and consistently serious environmental pollution will be avoided. This approach is essentially referred to as ‘qualitative growth’, or sustainable intensification. To put it another way, it means making efficient use of production resources and modern technologies to increase productivity whilst at the same time safeguarding the ecosystem.

High nutrient surpluses on forage-producing farms

In the past more intensive dairy systems were associated with a substantial rise in livestock productivity (especially milk), but not with a corresponding increase in on-farm forage production and grassland productivity. This meant that the high performance potential of dairy cattle could only be achieved by importing large quantities of off-farm feedstuffs such as concentrates and protein feeds (soya). As a consequence, on most farms nutrient imports in the form of feed far exceed the farm’s nutrient exports in the form of animal products such as milk and meat. Nitrogen (N) – the ‘problem nutrient’ – has particularly low efficiency levels of no more than 30 % in milk production. Forage growers therefore have a high nutrient surplus in nitrogen which in statistical terms has remained stagnant at just over 100 kg/ha for over 20 years. With a nitrogen legacy of 80 kg/ha, farmers are a long way from achieving nitrogen balance targets. It remains to be seen whether a significant reduction in nutrient surpluses can be achieved on intensively managed forage-producing farms without taking any further action. Nonetheless, there is mounting political and therefore social pressure to drastically reduce nutrient surpluses in intensive livestock farming and at the same time significantly increase nutrient

Perennial ryegrass is the most productive and nutritionally valuable forage grass.

Perennial ryegrass has the highest forage quality. Farmers should aim to maximize the yield potential of their land.

efficiency. Although there is not necessarily a general correlation between high nitrogen surpluses and the potential for nitrogen leaching, intensively managed forage-producing farms would be well advised to pull out all the stops in order to comply with the requirements for water pollution control.

Optimising grassland and improving efficiency

Existing nutrient surpluses can be substantially reduced in grassland management primarily by consistently exploiting the continuous advances made in production technology and crop breeding. Obviously this also entails improving harvesting methods (avoiding forage losses from the field to the cow) and adapting feed regimes and husbandry to satisfy requirements for productivity and animal welfare.

Figure 1 draws on a full cost analysis conducted by the Schleswig-Holstein Chamber of Agriculture (THOMSEN, 2014) involving 1114 farms (fiscal year 2012/2013) to illustrate the substantial cost differences between indivdual forage-producing farms. For instance, the differences in feed costs alone between the supposed 'better performing' 25 % and 'poorer performing' 25 % of the farms are almost 6 euro cents per kg ECM. This may not sound like much at first, but based on a farm yield of one million kg of milk, it equates to a difference of around 60,000 euros in feed costs alone. In the federal state of Schleswig-Holstein average milk yields from forage on the most successful dairy farms in recent years were around 20 % higher than those of the least successful farms, and even 30 % higher in the states of Baden-Wuerttemberg and Bavaria. Successful farms report higher milk yields and in particular, higher milk yields from forage. These farms need less grazing per cow. Higher grassland productivity can largely be explained by good grassland management. A pertinent evaluation was conducted by the North Rhine Westphalia Chamber of Agriculture (2013/14) in upland grassland areas. This evaluation, too, reveals large variations in forage output between individual farms (Table 1). The 'good' farms are able to meet 70 % of their energy requirement from forage, which in upland areas is available primarily in the form of grassland. This performance potential can only be achieved from very good forage, in other words, high-quality grassland. This means that the better farms achieve considerably higher milk yields, whilst at the same time using fewer concentrates.

Tab. 1: Influence of forage output in upland areas

		Forage output (kg)		
		low	medium	high
Number of farms		**87**	173	74
Dairy cows		134	102	95
Milk yield	kg ECM/cow	8,226	8,145	8,716
Concentrates	dt FM/cow g FM/kg ECM	25.6 310	22.9 279	21.3 242
Forage output **Energy share from forage**	**kg ECM/cow** **% of milk**	**816** **52**	**2,633** **64**	**4,025** **70**
Concentrate	ct/kg ECM	9,8	9,.2	8.3
Forage	ct/kg ECM	15.6	15.7	15.0
Forage costs	ct/kg ECM	25.4	24.9	23.3
Forage area	ha/LSU	0.54	0.58	0.58
Procuction cost		**48.6**	**48.7**	**46.7**

(Evaluation conducted by the North Rhine Westphalia Chamber of Agriculture 2013/14)

So why are the majority of forage-producing farms unable to improve their forage output – in terms of productivity of both livestock and land? The enormous differences in the forage output of individual farms can surely not be attributed to natural site factors alone. It also comes down to the quality of grassland management. After all, many farmers are often more knowledgeable about livestock management and do not focus on grassland to the same extent, especially when relatively large proportions of arable land are available for growing maize or other forage crops. In these circumstances the yield and quality potential of the grassland is not utilised to the full.

Consultation boosts profitability

Investing in sound professional consultation on grassland management is usually very beneficial for crop management practices and therefore the farm's viability. The key benefits are harnessing the farm's grassland reserves, increasing livestock performance from farm-produced forage, reducing external feed inputs and therefore nutrient imports and in effect, removing nutrient surpluses.

Tab. 2: Yields and costs of grass silage production

Yield class	t DM/ha	< 0.8	0.8–10	10–12	> 12
Average yield	t DM/ha	7.0	8.9	10.9	14.9
Energy	MJ NEL/kg DM	6.11	6.11	6.10	6.01
Energy yield	MJ NEL/ha	43,300	54,400	66,300	89,500
Direct costs	€/ha	322	459	470	405
Labour & machines	€/ha	908	1,001	983	1,014
Total costs	**Ct./10 MJ NEL**	38.3	35.6	29.5	20.9

Source: Schleswig-Holstein cattle records 1013/14, n = 515 farms

It pays to invest in grassland

As Table 2 shows, there is a clear correlation between yield and costs. The productivity and yield potential of grassland largely depends on its species composition. Permanent grassland swards used intensively for milk production should ideally contain 70–80 % high-quality forage grasses. Perennial ryegrass is the most productive forage grass with the highest nutritional value. However, a high percentage of perennial ryegrass can be maintained in the long-term only through continuous upkeep. For grazing land in particular, this includes regular reseeding using suitable reseeding mixes containing a high proportion of perennial ryegrass. It is also important to select appropriate varieties recommended for the region in question. Neglect is often the root cause of a decline in productivity. It's clear that it always pays to invest in grassland.

Weeds like rough-stalked meadow grass, which can proliferate if reseeding is neglected, have no more than 50 % of the yield potential of perennial ryegrass. In other words, farmers will loose out on a potential yield of 0.8–1.2 t/ha DM by allowing the composition of their grassland to contain 20 % rough-stalked meadow grass per hectare. Assuming that the silage value is 32 euro cents/10 MJ NEL, this example gives a feed value difference of up to 200 euros/ha. An increase in grassland productivity may well be associated with higher direct and labour costs (see Table 2), but the overall costs per unit of energy of forage produced are significantly lower. So although improving grassland may initially appear costly, it ultimately reduces feed costs. In most cases there is a close link between high output and high forage quality because our forage grasses are bred for high nutritional value and yields, making them vastly superior to natural grasses which have not been selectively bred in terms of yield and quality.

Grazing – a niche system

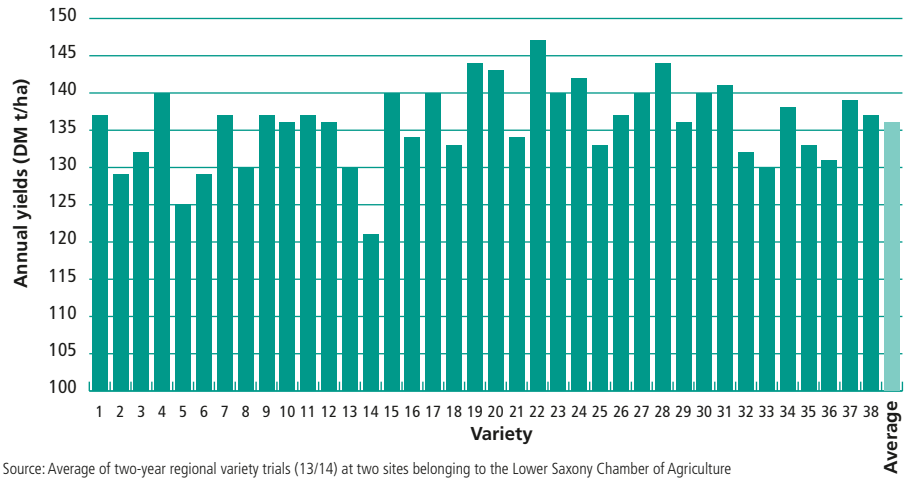
Grazing offers clear advantages from the point of view of crop cultivation, animal welfare and image. Farms with the right conditions (consolidated fields, climatic requirements, agricultural expertise) can achieve by far the highest milk yields per hectare using adapted, intensive grazing systems.

Cows reared in intensive grazing systems always have access to fresh, energy-rich fodder (up to/above 7 MJ NEL). This produces high milk yields from forage (up to 14,000 kg ECM/ha). Based on 10 MJ NEL, low-cost grazing systems can reduce costs by 8–10 ct compared with grass silage. Even though there is intensive pressure on farmers to use intensive pasture-based grazing systems – and subsidies available – they are likely to remain a niche in the future in the face of continually rising numbers of dairy cattle.

False economies

There is empirical evidence that profits increase by investing in grassland by regularly reseeding, adapting nutrient application rates, liming, rigourously controlling vermin and seeking expert advice. However, at this stage it is not possible to adequately gauge whether that is ultimately enough to achieve sufficient returns from milk production even during extended periods of low milk prices and at the same time meet targets for significantly lower nitrogen surpluses. Nevertheless, improving milk yields from forage by sustainably improving grassland management is a major step towards increasing the ecological efficiency of intensive dairy farming – in other words, achieving qualitative growth. But in an era of low milk prices the liquidity of farms is falling and this problem is being further accelerated by rising input costs (fertiliser, feed, seed, concentrates etc.). Under these conditions, experience suggests that grassland management is the first place for savings to be made since their impact is not immediately obvious or measurable. This includes in particular reseeding and applying lime or a basal dressing. As a result, grassland productivity progressively declines, accompanied by knock-on effects on livestock, farm and therefore economic output.

Abb. 2: Yields from different varieties of perennial ryegrass vary by as much as 2.5 t/ha



Source: Average of two-year regional variety trials (13/14) at two sites belonging to the Lower Saxony Chamber of Agriculture

The primary goal of breeding is to increase yields

Whatever the crop, breeding brings continuous improvements and increases in yield, improved quality and resistance to and tolerance of pests, diseases and unfavourable weather conditions. In addition to technical advances, the continuous use of forage crops that have been gradually improved through breeding is a key factor in achieving qualitative growth. Only new varieties with genuine agronomic merit succeed in passing the numerous tests for inclusion on National Lists. The 152 varieties of perennial ryegrass currently approved by the Federal Plant Variety Office (BSA) exhibit great genetic variance in terms of maturity, persistence and yield. Figure 2 draws on two-year yield results from a regional variety trial conducted by the Lower Saxony Chamber of Agriculture

on two sites to illustrate the potential differences in yield between the varieties of perennial ryegrass tested. The difference between the highest and lowest yielding variety with the same fertiliser input is around 2.5 t/ha DM. Even when the figures are based on the average of all the varieties tested, the highest yielding variety produces an additional yield in excess of 1 t/ha. Assuming that all varieties have a crude protein content of 15 %, the highest yielding variety would remove around 60 kg/ha more nitrogen than the lowest yielding variety and 30 kg/ha more than the mid-yielding variety. This indicates that high-yielding varieties can also help to improve nutrient efficiency.

Conclusion

Low milk prices and rising input costs continue to challenge the economic situation of dairy farms and rapidly accelerate structural change. At the same time, significant potential for improving the quality and productivity of forage on many farms remains untapped due to a lack of consistent grassland management. Forced to buy in costly feed, farmers are squandering their money in wasting this potential. High feed purchase costs not only put an undue strain on farm finances, they also affect nutrient balances, which is not something farmers can afford to overlook in the light of water pollution control legislation. The problem is that most farmers are not aware of this potential because they have little idea of their grassland yields and no way of measuring them. Also, there is an urgent need for advice on how to assess the agronomic potential of grassland. We should aim to rekindle the interest in grassland – among famers, consultants, scientists, society and above all, educators. This is the only way to fully exploit the added value grassland can offer.

Intensive breeding and varietal testing of grasses are fundamental to improving grassland yields and quality.

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