TECHNICAL NOTE

SusCatt

SusCatt - Increasing productivity, resource efficiency and product quality to increase the economic competitiveness of forage and grazing based cattle production systems

Does it matter how much forage our dairy cows eat?

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Challenge

Increasing milk production from individual cows is questioned for several reasons; higher yields need greater reliance on purchased concentrate and less use of grazing and other home-grown feeds. The motivation for higher yields is profitability but also better feed efficiency, and it is claimed higher production reduces the environmental impact of every litre of milk produced. However, less is known about the proportion of forage in the cows' diets and how, in practice, this affects profitability and environmental indicators.

Objectives

We set out to assess how the proportion of concentrates in the diet of dairy cows, on traditional combined milk and beef farms in Central Norway, affects both milk production and profitability as well as indicators of environmental impact.

What did we do and what did we find?

Data from 200 dairy farms in Central Norway, recorded by the TINE dairy cooperative advisory service, were categorised into 3 equal sized groups; 'Low', 'Medium' and 'High', according to the level of concentrate feed in the cows' diet. Records covered details of herd feeding, production, animal health and farm accounts for three fiscal years (2014-2016). Data was used to calculate a cradle to farm-gate life cycle assessment to judge the environmental performance. The results are expressed per kg energy corrected milk (ECM) and beef delivered, where 0.42 kg beef meat is equivalent to 1 kg ECM.

Photo: Steffen Adler

Table. Average performance records of farm groups (allocated on concentrate use per cow)

	Unit	Concentrate level cows		
		Low	Medium	High
Number of farms		68	67	68
Concentrate cows	Kg DM/MCU	2173^{c}	2655^{b}	3051a
Forage proportion in the diet	MJ/total MJ	0.63^{a}	0.56^{b}	0.52^{c}
Pasture proportion in the diet	MJ/total MJ	0.10^{a}	0.07^{b}	0.05^{b}
Dairy cows	MCU	29.7^{b}	35.4^{ab}	37.7^{a}
Stocking density	MCU/ha	1.13^{b}	1.26^{ab}	1.29^{a}
Milk quota	1000 L	210.1^{c}	270.3^{b}	293.9^{a}
Quota fill	Proportion	0.93	0.93	0.93
Milk yield per cow	kg ECM/MCU	7868^{c}	8421^{b}	8906^{a}
Meat per total herd size	Kg/MCU cattle	130	135	136
Global warming potential	Kg CO_2-eq/kg ECM	1.42	1.35	1.37
Energy intensity	MJ/kg ECM	4.31	4.10	4.17
Nitrogen intensity	Kg N/kg N	7.00	6.75	6.75
Area of purchased concentrate	ha/ha	0.39^{b}	0.43^{ab}	0.46^{a}
Land occupation	m^2/kg ECM	3.24^{a}	2.88^{b}	2.84^{b}

^{abc} Values within rows with different superscript differs significantly
NEL is net energy lactation. MCU is milking cow unit, equivalent to one dairy cow staying in the herd for 365d, standardised to an annual NEL requirement of 42000 MJ. The whole herd is calculated to MCU.
ECM is energy corrected milk yield
Area of purchased concentrate is the proportion of the total area used on other farms for producing ingredients in purchased concentrate. Total area is the farm area plus area used on other farms for producing imported feed.
Land occupation is the total area used, on and off farm, per kg ECM delivered

Average findings for the 3 groups are summarised in the table above, highlighting differences. Annual concentrate supplementation averaged 2.2 (low), 2.7 (medium) and 3.1(high) metric tons DM per cow with corresponding forage intakes estimated as 63, 56 and 52% of total net energy intake. Whereas average farm size was similar across groups (45 ha), 'Low' farms had lower stocking rate than 'High' and a higher proportion of grazed forage in the diet than either 'Medium' or 'High' farms. Cows in 'High' farms produced about 1 metric ton more energy corrected milk (ECM) annually than cows on 'Low' farms. Milk production in Norway is restricted by quota, and farms in all three groups achieved a similar 93% quota fill. Thus, it appears that the animal production level and therefore the feeding strategy were closely linked to the quota.

There was little difference with respect to indicators of global warming potential and energy or nitrogen use intensity (Table). Farmers using the least concentrates ('Low') had greater use of local land resources than the two other groups, being less dependent on land away from the farm to grow crops for purchased concentrate. However, the total land occupation per kg milk and meat delivered was greater on 'Low' farms than the two other groups.

Milk and meat subsidies were similar, but the 'Low' group had higher agri-environmental, livestock farming and animal payments per kg milk and beef than the other groups. This, combined with higher milk prices (possibly due to lower cell counts), resulted in 'Low' farms having higher revenues than the other two groups (Figure). Total operating costs were similar although the 'Low' group spent less money on concentrate but more on forage production than the other. Farms in the 'Low' group had lower total production dependent fixed costs, mainly because of the costs involved with forage production and machine maintenance. Overall, 'Low' farms on average performed better financially, with higher gross margin and contributing margins than 'Medium' and 'High' farms (Figure opposite). However, it is important to note that farms' own labour was not recorded and hence not accounted for in this analysis.

Conclusion

Farms in Central Norway, feeding more forage and pasture to their dairy cows, achieved lower milk yield per cow but higher profitability than farms feeding more concentrate feeds, mainly because of more governmental subsidies per kg milk and meat produced. Also, our analysis does not support the general assumption that higher concentrate feeding and milk production lowers global warming potential and energy needed per kg of milk and meat produced compared with more extensive systems.

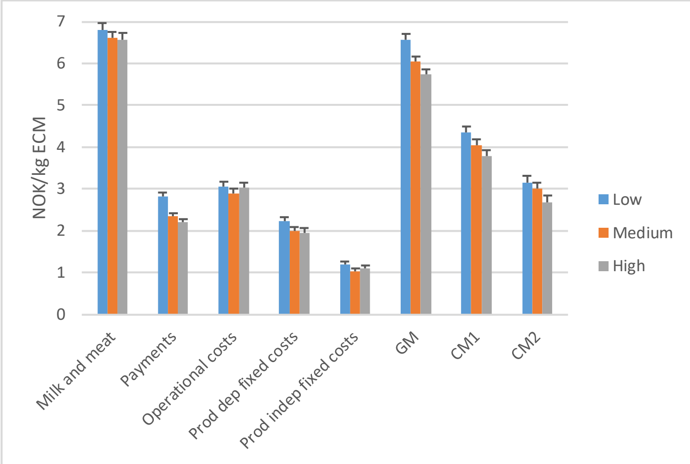

Figure. Comparing the economic performance (NOK/kg ECM delivered) of farm groups. GM, gross margin, is milk and meat sale + governmental payments – Operation costs. CM1, contribution margin, is GM - Production dependent fixed costs. CM2, Contributing margin, is CM1 – Production independent fixed costs.

Imprint

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