Economic Evaluation of Longevity in Organic Dairy Farming

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Abstract

The aim of this study was to highlight the economic importance of longevity in organic dairy cattle husbandry. Performance and reproductive data of 44,976 Austrian organic Simmental dairy cows were analysed by applying a bio-economic model. A farm scenario as well as different market situations were modelled. Overall costs declined with increasing longevity, due to dropping replacement costs. Annual profit was influenced considerably by milk yield and longevity. Short-lived animals needed substantially higher annual milk yields than long-lived animals to achieve equal annual profits. The applied market scenarios showed an increasing importance of longevity in situations of increasing economic pressure (+20% of concentrate price). It has been proven that extending longevity allows lower milk yield levels without decreasing profitability. Lower use of concentrates and reduced dependence on off-farm inputs and market fluctuations are further benefits.

Key words: lifespan, profitability, costs, dairy cow, sustainability

Introduction

Animal health and welfare, sustainability and minimal off-farm inputs are crucial principles of organic dairy farming. In contrast, maximizing milk yield per cow and early maturity have been main breeding goals during recent decades in dairy cow breeding. As there are several negative genetic correlations between performance and fitness traits as well as between milk production level and animal health, increasing milk performance has led to serious declines in fitness and health as well as animal welfare and therefore longevity (Essl 1996, Fleischer et al. 2001, Knaus 2009, Oltenacu and Broom 2010). The stated developments and the changes in diets resulted in a sharp increase of feeding, replacement and veterinary costs. Therefore the high-performance strategy is very questionable from both an ecological and an economic point of view. The aim of this study was to highlight the economic importance of longevity for organic dairy cattle husbandry.

Material and methodology

Performance and reproductive data of all Austrian organic dual-purpose Simmental dairy cows (n=44,976) included in the national recording program and culled between 2000 and 2010 formed the data set for a bio-economic model. Animals were grouped according to completed lactations (culled after 1, 2, 3…10 lactations) and within these lactation groups into performance groups according to lifetime energy-corrected milk (ECM) performance (average, 5,000 best, 1,000 best, 500 best and 50 best animals). Model assumptions were made in order to represent an average Austrian organic dairy farm with 150,000 kg annual milk quota. Ascertainment of profits was done by full cost accounting including the following parameters:

Profit (€ year^{-1}) = revenues (milk, culling, calves) – costs (feed, replacement, veterinary treatment, insemination, building occupancy, factor costs) + subsidies (environmental subsidies, livestock aid, single farm payment)

A precise description of the methods used and model assumptions was reported by Horn (2011). In short, to estimate annual feed costs rations were modelled taking into account milk yield and milk composition, life weight and life weight gain as well as nutrient mobilisation. During lactation rations contained forages (grass silage, hay, pasture and corn silage) and concentrates for energy and protein supplementation, but rations composition was adjusted according to milk yield. During the dry period ration consisted of forages only. Annual feed costs were calculated as full costs taking the maintenance of grassland and harvesting activities, manure application as well as fence building and maintenance costs for pasture into account. Corn silage and concentrates were assumed to be purchased. Costs for heifers needed for replacement, revenues of calves as well as costs for insemination and veterinary treatments were estimated depending on milk yield potential. Annual building occupancy and factor costs were estimated based on official reference values and included barn and storage charges as well as land use, milk quota and labour wage rate. Milk price was set according to Austrian organic milk market data. Culling revenue was estimated based on life weight at the end of the animal's productive life, carcass yield and slaughter price. Subsidies included in the calculations were single farm payments, livestock aid and environmental subsidies pursuant to European and Austrian regulations for organic agriculture. To estimate how future market developments and changing production costs might affect farm profit, varying costs of concentrates (+/-20% price) were tested under ceteris paribus conditions.

Results

The description of the results excludes intermediate performance groups and focuses on the average and 50 best animals of each lactation group.

Costs

Annual mean total dry matter feed intake of the average cows was 5,402 kg (± 207) and 6,531 kg (± 214) for the 50 best animals respectively. It rose with increasing milk yield, as did concentrate intake. Annual concentrate consume of average animals was calculated 787 kg (± 81), while the mean concentrate intake of the 50 best animals was 2,087 kg (± 226). Cows´ feed and replacement costs constituted the largest proportion to total costs. Feed costs of cows increased with annual milk production and were € 906 (± 31) and € 1,657 (± 160) for average and best 50 animals, respectively. Feed costs seemed to react disproportionately in comparison with annual milk yield increase, for example for animals culled after four lactations, they increased by 96 % while annual milk yield increased 60 %. When comparing total annual costs, they increased with rising milk yield and were € 1,864 (± 225) and € 2635 (± 398) for average and best 50 animals respectively. With advanced longevity, replacement costs clearly declined and dropped by 74 % comparing animals with one and five completed lactations. Total annual costs rose with increasing milk yield, but declined with rising longevity.

Revenues

Milk revenue constituted the largest share and follows annual milk yield. Culling revenues declined with increasing longevity. Higher yielding groups had substantially higher total revenues than average cows, € 4,082 (± 322) and 2,779 (± 64), respectively. Total revenues rose until the 4th lactation for average animals, and the 3rd lactation for the 50 best cows.

Profit in farm model scenario

The number of cows and the acreage required declined with rising milk yield. In contrast, total profit increased and was clearly higher for the 50 best animals than for the average cows. By increasing longevity, profits increased up to the 6th lactation for the average and up to the 5th lactation for the

50 best animals. Groups with a higher milk yield achieved positive profit earlier than the average animals, in the second and third lactation, respectively. In Figure 1 profit functions for different levels of average herd life are plotted. As mentioned, both milk yield and longevity affected profits. Increasing milk yield led to declining marginal profits, as the slope of functions decreases considerably. Furthermore, marginal profits dropped less in higher lactation groups (for example 2 versus 5 lactations). It can be seen that extending longevity led to degressively increasing profits, as the level of profit functions moved upwards. As a result, an annual targeted profit of € 4,000 could be achieved with different strategies. A herd with an average herd life of two lactations needed 7,300 kg ECM per cow year^{-1}. To meet the same profit goal, herds with a longevity of three, four and five

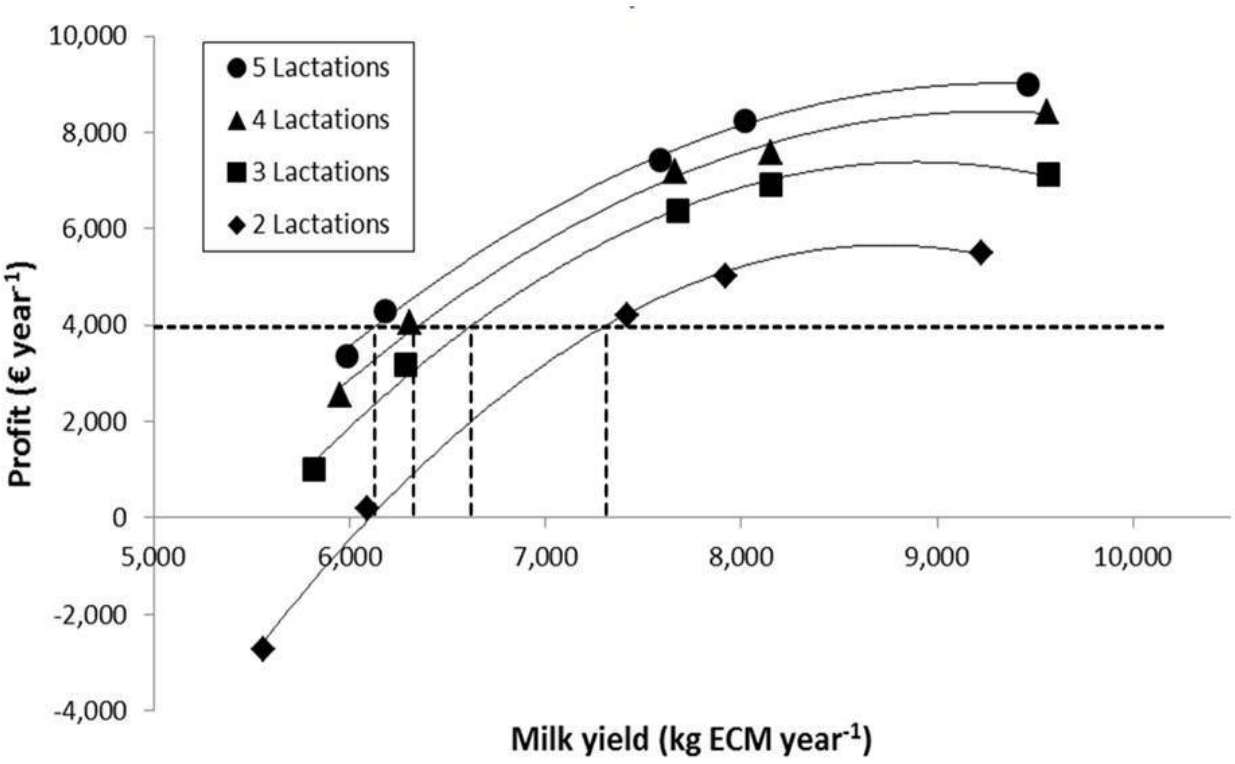

Figure 1. Effect of annual energy corrected milk yield (ECM) and longevity on total annual profit

Changing conditions of concentrate markets had severe effects on model farm profitability (Figure 2). A 20% increase in the price of concentrates (+20 C) made profits drop considerably and also reduced the marginal profits of increasing milk yield. Lower concentrate prices (-20 C) had the opposite effect.

Discussion

The current average herd life levels do not exhaust the full potential of dairy industries' profitability, therefore the relative importance of herd lifespan, health, and reproductive traits should be strengthened. A reduction of milk yield does not necessarily lead to lower profits, if it is accompanied by an increase in longevity. This allows lower amounts of concentrates and sustains the on-farm production of feedstuffs, especially in pure grassland areas. Additionally it supports fulfilment of the organic farming principles of sustainability, minimizing off-farm inputs and closing nutrient cycles, and may lead to a higher consumer acceptance. Given that in the future, less market regulation, decreased economic compensation for farmers, lower milk prices, and a potential increase in

production costs seem likely, strategies to minimise inputs and costs appear to be economically and ecologically superior.

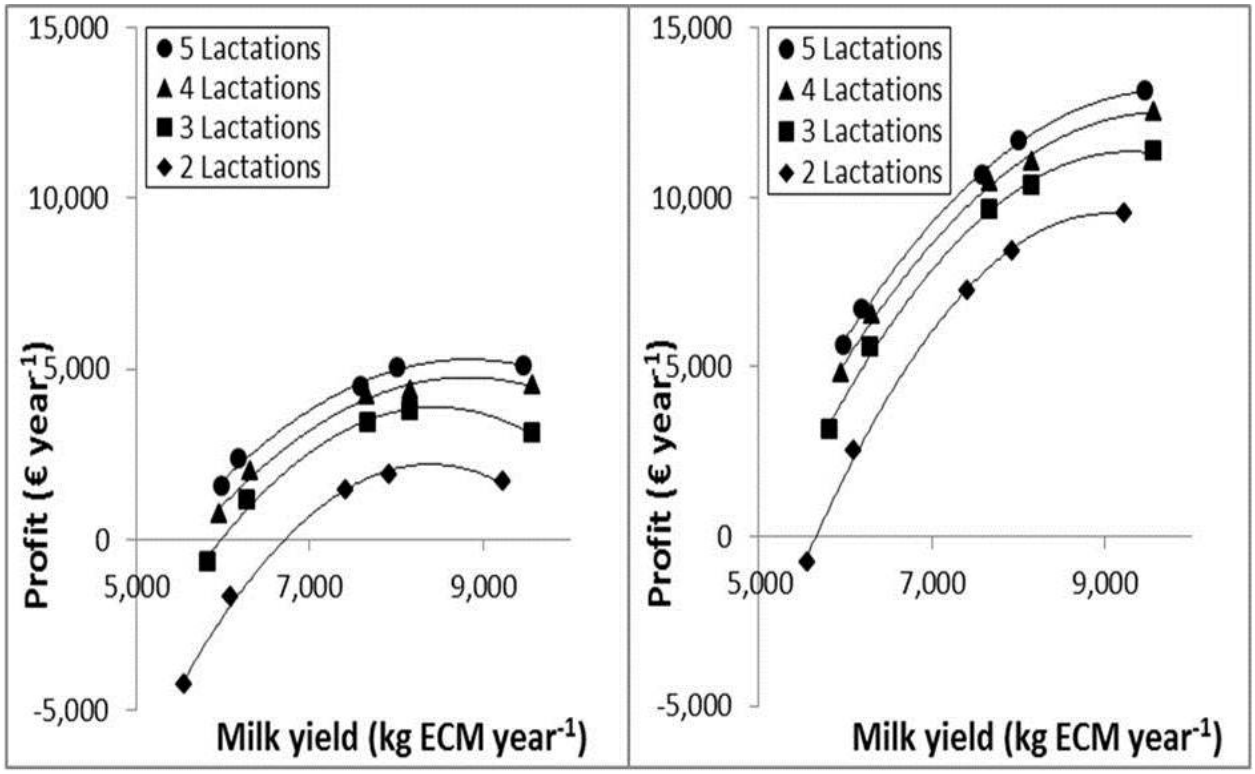

Figure 2. Annual profits for different market trends (left figure: + 20% of price of concentrate; right figure: -20% of price of concentrate).

Suggestions to tackle the future challenges of organic animal husbandry

Dairy cow´s longevity is an essential indicator for animal health and welfare and therefore for the sustainability of a milk production system. It´s advancement should be one of the main targets in the future of organic dairy cow husbandry. This will not only lead to a reduction of concentrate input and production costs but also to a higher consumer acceptance, which might be of crucial importance in the near future as Alpine agriculture is strongly depending on public subsidies.

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