Management, feeding, production, reproduction and udder health on organic and conventional Swiss dairy farms

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Abstract

Organic dairy farms (OP; n=60) and conventional dairy farms (integrated production, IP; n=60), matched in size, location, and agricultural zone (altitude), were studied for possible differences in management, feeding, production, reproduction and udder health. OP and IP farms were similar in size (17.7 and 16.9 ha), milk quota (65 900 and 70 000 kg/year), cow number (14 and 15), cow age (5.3 and 5.2 years), housing of cows of the Simmental × Red Holstein or Holstein breeds (87 and 75%; 45 and 60%), but differed significantly with respect to loose housing systems (18 and 7%), outside paddocks (98 and 75%), energy-corrected 305-d milk yield (5 695 and 6 059 kg), milk protein content (31.8 and 32.7 g/kg), use of bucket milking systems (73 and 33%), observance of regular (12-h) milking intervals (47 and 68%), routine application of the California-Mastitis-Test (10 and 28%), teat dipping after milking (25 and 43%) and blanket dry cow treatments (0 and 45%). Milk somatic cell counts on OP and IP farms (119 000 and 117 000/mL) and reproduction data were similar and there were no significant differences between OP and IP farms as concerns available feeds, planning and management of feeding. Alternative veterinary treatments were used more often on OP than IP farms (55 and 17%). Main causes for cow replacements on OP and IP farms were fertility disorders (both 45%), age (40 and 42%), sale (30 and 37%) and udder health (35 and 13%). Between OP and IP Swiss dairy farms thus relatively few larger differences were found.

Keywords: cows, organic farm, management, feeding, milk yield, reproduktion

Management, Fütterung, Produktion, Reproduktion und Eutergesundheit in schweizerischen Milchviehbetrieben mit biologischer und konventioneller Produktion

Milchviehbetriebe mit biologischer (OP; n=60) und mit konventioneller (integrierter) Produktion (IP; n=60), angepasst bezüglich Grösse, Lokalisierung und Landwirtschaftszone (Höhe ü. M.), wurden auf mögliche Differenzen bezüglich Management, Fütterung, Produktion, Reproduktion und Eutergesundheit untersucht. Die OP- und IP-Betriebe waren ähnlich bezüglich Grösse (17.7 and 16.9 ha), Milchkontingenten (65 900 und 70 000 kg/Jahr), Kuhzahl (14 und 15), Alter der Kühe (5.3 und 5.2 Jahre), Haltung von Kühen der Simmental × Red Holstein- und Holsteinrasse (87 und 75%; 45 und 60%), unterschieden sich aber signifikant bezüglich Laufstallhaltung (18 und 7%), Auslauf (98 und 75%), energie-korrigierter 305-Tage Milchleistung (5 695 und 6 059 kg), Milchproteingehalt (31.8 und 32.7 g/kg), Anteil Eimermelkanlagen (73 und 33%), Einhaltung regelmässiger (12-h)-Melkintervalle (47 und 68%), routinemässiger Anwendung des California-Mastitis-Tests (10 und 28%), regelmässigem Zitzentauchen nach dem Melken (25 und 43%) und routinemässigem Trockenstellen mit Antibiotika (0 und 45%). Die Zellzahl auf den OP- und IP-Betrieben (119 000 bzw. 117 000/mL) und die Fruchtbarkeitsergebnisse bei den OP- und IP-Betrieben waren ähnlich und es bestanden keine signifikanten Unterschiede zwischen OP- und IP-Betrieben bezüglich verfügbaren Futtermitteln, Fütterungsplanung und Fütterungsmanagement. Alternative tierärztliche Therapieverfahren wurden auf OP-Betrieben häufiger angewandt als auf IP-Betrieben (55 und 17%). Hauptsächliche Gründe für die Remontierung von Kühen in OP- und IP-Betrieben waren Fruchtbarkeitsprobleme (beide 45%), Alter (40 und 42%), Verkauf (30 und 37%) und Eutergesundheit (35 und 13%). Zwischen OP- und IP-Betrieben wurden nur relativ wenige grössere Unterschiede gefunden.

Schlüsselwörter: Milchkühe, Biobetrieb, Management, Fütterung, Milchproduktion, Reproduktion

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Introduction

About 90% conventional Swiss dairy farms operate along the guidelines of integrated production (IP). General goals besides economical success are sustainability of production, protection of soil, water, air, landscape and nature. Organic production (OP) increased during recent years and presently about 10% of all Swiss dairy farms operate along the regulations and certification criteria for production under the Bio Suisse Bud label (Fuhrer, 2004). These mandate that (a) at least 90% of total dry matter fed to cows must be produced organically, (b) almost exclusively homegrown concentrates should be fed and (c) the use of genetically engineered feedstuff components, growth promoters, hormones and of chemotherapeutical substances for disease prevention (such as for mastitis prevention of dry cows) is forbidden. Therapeutic interventions should be based mainly on alternative methods and antibiotics be used only after veterinary prescription. Inadequate feeding due to insufficient provision of energy- and protein-rich concentrates and of minerals and vitamins and prophylaxis against and treatment of infections and of parasitic infestations may have negative effects on cow health and be in part responsible for reduced performance of OP cows (Roesch et al., 2005).

Only very limited studies have been published on dairy cows kept on Swiss OP farms. In a study of Augstburger et al. (1988) on cow fertility, health status and milk production the sample size was relatively small, included only Swiss Brown cattle, the location of farms was restricted to a valley region and OP and IP farms could not directly be compared. A first large-scale epidemiological study on health status and nutrition that used a stratified random sample of 152 certified Swiss OP dairy farms and 1907 cows during the winter and summer season was performed in 1997 by Trachsel et al. (2000) and Busato et al. (2000a,b). However, this study was designed to investigate the *status quo* on OP farms and not to compare OP farms with conventional farms. Direct comparison of data from OP and IP dairy farms in other countries was also rarely performed (Lund and Algers, 2003) and those results due to different husbandry are not fully transferable to the particular situation in Switzerland. In the present study we have studied whether there are differences between OP and IP farms with respect to management, feeding, housing, milking procedures, milk production, reproduction and health status of dairy cows.

Animals, Material and Methods

Farms and animals

All studied farms were located in the canton of Bern which was selected because of its geographical diversity (midland, hill and alpine regions) and because it has a particularly large number of OP farms. Only farms that had ≥ 5 dairy cows, a milk quota of > 10 000 kg per year and regular milk control performed by the breeding organizations were included so that sufficient data on milk performance and milk composition would be available. All OP farms had to be certified by BioSwiss (Frick) and had to practice organic farming for ≥ 3 years. Information on registered OP dairy farms in the canton of Bern was obtained from Bio Inspecta, Frick and on IP farms from the Federal Office of Agriculture, Bern. To the available OP farms, 4 IP farms were matched under the condition that they (1) were in the same or adjacent community, (2) had a comparable number of dairy cows and (3) were in the same agricultural zone. Agricultural zones (defined by Federal Office of Agriculture, Bern) were categorized as (a) midlands and prealpine zones (400 to ≥ 600 m above sea level), (b) mountain zones I & II (601 to ≥ 850 m above sea level) and (c) mountain zones III & IV (851 to 1150 m above sea level). Out of the pool of available farms, 60 OP and 60 associated IP farms were selected so that the distribution reflected that of all OP farms with > 10 000 kg annual milk quota in the different agricultural zones. This resulted in 13 farm pairs from the midland/prealpine zone, 34 from mountain zones I+II and 13 pairs from mountain zones III+IV. For each of the zones the pairs were chosen from the available pool using computer-generated random numbers.

On the 120 farms, a total of 1848 dairy cows were housed. Due to the limited resources, only 1000 cows could be included in the study. Three approximately equal frequency categories of farm sizes (5–10, 11–19, and > 19 cows per farm, respectively) were defined. Only cows with at least one previous lactation were included in order to have milk production data for a full production period. According to the relative distribution of the 1848 cows within these three farm size categories, with a sample of 5 cows from farms with 5–10 cows, 8 cows from farms with 11–19 cows and 13 cows from farms with > 20 cows, the target of 1000 cows was reached. In total, 483 OP cows and 487 IP cows were sampled. For 961 of these 970 cows, lactation data of the preceding lactation were also available.

Data collection

Farm visits started in June 2002 and finished in May 2003. Data on farm size, housing conditions, general farm management, milking equipment and management, feeding strategy and management, cow

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breed(s), cow health management as well as the individual cow characteristics (such as ear tags, age, lactation number, data of services, previous calving dates) were collected using semi-closed questionnaires and standardized examination protocols. Milk production data (milk yield, fat, protein, lactose, and urea concentrations) and the somatic cell counts (SCC) were obtained from the Swiss Simmental and Red and White Cattle Breeder Association (Zollikofen), from the Swiss Brown Cattle Breeder Federation (Zug) and from the Swiss Holstein Breeder Association (Grangeneuve).

Statistical analyses

Data from various sources were recorded and stored in Microsoft-Excel spreadsheets and subsequently merged within an MS Access database. Farm-level means were calculated and further used in the context of this work. Initial descriptive data analyses were performed using Microsoft-Excel and the statistical software package NCSS 2001 (www.ncss.com). Results are presented as medians and 2.5^{th} – 97.5^{th} percentile ranges (rangep); for normally distributed variables data this would closely resemble the means and 95% confidence intervals. For ordinal and nominal variables, counts and percentages were used.

For comparisons of farm-level parameters between farm types, a matched analysis (with the 60 OP/IP farm pairs as matching or repetition variable) was used. The association between farm type (OP and IP) and each categorical (binary, nominal, and ordinal) factor was assessed in an univariable matched logistic regression (LR) routine of the general form $\text{logit}\{p_j(x_{ij})\} = \alpha_j + \beta_1 x_{1ij}$, where x_{1ij} is the value of the explanatory (risk) factor, $I = 1,2,\ldots,k$ denotes the ith individual and $j = 1, 2, \ldots, M$ the jth matched pair. Cross tabulations and the module (clogit) within Intercooled STATA v7 were used to derive frequencies and related p-values for the differences between farm tpes. All continuously (interval-)measured variables were first ranked ascending by value (*Rank* option within STATA v7), and a repeated measures ANOVA routine (*anova*, STATA v7) on these rank values with farm type as main factor and the matching (farm pairs) as repetition factor was performed. The general model repeated measures ANOVA form was $Y_{ijk} = \mu + \alpha_i + \beta_j + \varepsilon_{ijk}$, where $i = 1,2,\ldots,I$, $j = 1,2,\ldots,J$ and $k = 1,2,\ldots,K$. This model expresses the value of the response variable, Y, as the sum of the overall mean μ, the contribution of the ith level of a potential risk factor α_i, the contribution of the jth level of the matched pair β_j,, and the contribution of the kth individual ε_{ijk} (often called error term). In the assessment, the P-value for the risk factor contribution was that of interest. All statistical tests were considered to be significant at $P < 0.05$.

Results

Farm characteristics and management

The 60 farm pairs were from a wide range of geographic locations within the canton of Bern. On average, OP farms in the study had been certified for 6 years (range_p 4 to 24 years) under the guidelines for organic farming. The median size of OP farms (17.7 ha; 7.6–48.9 ha) and of IP farms (16.9 ha; 7.8–41.2 ha) was similar. The OP farms housed a similar number of dairy cows (14; 10–28) as IP farms (15; 8–29). Annual milk quota of OP farms (median 65 900 kg; 18 575–181 875 kg) were non-significantly lower than of IP farms (70 000 kg; 27 735–190 125 kg). Almost all OP and IP farms generated all of their income (median 100%) with farm work, and milk production was the main source of farm income for 83% of both OP and IP farmers.

The vast majority of farms had tie stall barns. More OP farms (18%) than IP farms (7%) housed their cows in loose housing systems ($P = 0.083$). More IP farms (78%) than OP farms (28%) were equipped with some sort of a cow trainer ($P < 0.001$). In tie stall barns, 94 and 96% of OP and IP farms housed cows on rubber mats with a litter of straw, straw chaff or saw dust. More OP than IP farms had a paddock (98 and 75%, respectively; $P = 0.009$). The proportion of farms providing cows with < 1 h outdoor access during the winter season (43%), 1 h (30%) and more than 1 h (27%) winter outdoor access did not differ significantly between IP and OP farms. In summer all cows (except cows of one IP farm) had access to pasture, and a similar number of OP and IP farms (42% and 45%, respectively) allowed cows to have a several months sojourn on alpine pastures (> 1500 m above sea level).

In tie stall barns bucket milking systems were more often used on OP farms (73%) than IP farms (33%). The other farms were equipped with high line milk-

Table 1: Management variables on 60 organic (OP) and 60 integrated (conventional) production (IP) Swiss dairy farms.

Variables	Level	OP farms	IP farms	P-values
Milking interval (h)	12–12	28	41	0.017
	11–13	32	18	
	10–14	0	1	
Postmilking teat dipping	Yes	15	26	0.028
Routine antibiotic dry treatment of all cows	Yes	0	27	-
Number of California Mastitis Tests (CMT)	Cows with udder problems	54	43	0.002
	1 x per mo	3	15	
	>1 x per mo	3	2	

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ing systems. On 15 farms (11 OP, 4 IP) with freestall housing, 9 (60%) had milking parlors, one farm had a high line system, and the remaining 5 farms (33%) used a bucket system. Intervals between the two daily milking sessions differed between OP and IP farms (P = 0.017), with a higher proportion of IP farms (41/60) keeping a 12-h milking interval when compared with OP farms (28/60) (Tab. 1). Post milking teat disinfection was performed less on OP than IP farms (P = 0.028). Almost half of the IP farms (27/60) used antibiotic drugs for blanket dry cow therapy, whereas on OP farms chemotherapeutical agents for prophylactic purposes were not permitted. The California Mastitis Test (CMT), performed routinely once or more often per month, was less applied (P = 0.002) on OP (10%) than on IP farms (28%).

Additional farm and management data such as cubicle lengths, cubicle widths, square meters available per cow, kind of tie and loose housing barns, waste managements, cows with horns, hours per day on pasture or yard, number of performed claw treatments, yield of vacuum pumps and vacuum levels, material and service interval of teat gums, kind and frequency of cleaning of the milking unit and of pre-milking udder stimulation were not significantly different between OP and IP farms.

Feeds and feeding

There were no significant differences with respect to available feeds. Fed roughage was in 98% harvested on own pastures on both OP and IP farms and in summer cows in 42 and 45% of OP and IP farms were grazed, in part in alpine regions. Concentrates were purchased in 81% by OP and in 83% by IP farms, respectively. There were differences as concerns available feeds in summer and in winter with respect to grass, grass pellets, grass and corn silage, potatoes, (sugar and fodder) beets, brewers grains and extraction meals (rapeseed, soy bean). However, there were no differences between OP and IP farms, both during the summer and the winter feeding period, in the frequency with which ground fodder [grass, legumes and herbs in fresh form or as hey, grass pellets, straw, silage (grass, corn)], corn cubes, potatoes, (sugar and fodder) beets, bran, extraction meals (rapeseed, soy), grains (corn, barley, oat), brewers grains, salts and mineral supplements were fed.

The frequency of performing feed analyses of own-grown roughage on OP farms (23%) and IP farms (32%) and individual feeding based on feeding plans on OP (28%) and IP farms (38%) were similar, and planned feeding before parturition (to prepare cows for lactation) started at the same time on OP and IP farms. Furthermore, concentrate feeding was very similarly handled (with respect to individual feeding, feeding by automate, use of feed mixers) on both OP and IP farms.

Age, breeds and cow replacements

The median age of cows that participated in this study was 5.3 years (3.2–10.9 years) for OP cows and 5.2 years (3.1–11.0 years) for IP cows. The Simmental x Red Holstein crossbreed was present in 87 and 75% of OP and IP farms, respectively, purebred Holstein cows in 45 and 60%, purebred Simmental cows in 40 and 37%, and other breeds (Swiss Brown Cattle, Montbéliard, and Jersey) in 7 and 10%, respectively. In 70% of OP farms and 72% of IP farms more than one breed was kept. Differences in breed composition and cow age were not significant between production systems.

Annual cow replacement rates in most farms were comparable between OP (20%) and IP farms (30%). Milk quality parameters such as mastitis were an important incentive for replacement, and were more important (P = 0.017) on OP (35%) than IP farms (13%). Other reasons for cow replacements (age, reduced fertility, sale for breeding purposes, low milk yield) were similar on OP and IP farms.

Milk production

Median lactation numbers of cows that participated in the study on OP farms (4; 2–9) and IP farms (4; 2–10) as well as lactation lengths (days in milk) were similar. Energy-corrected milk yields (ECM; corrected for standard lactations lasting for 305 d) and milk protein content were significantly lower on OP than on IP farms, whereas lactation persistency, fat, lactose and urea concentrations were comparable on OP and IP farms (Tab. 2). The farm median of the (cow average) SCC values on OP and IP farms with 118 000 and 119 000 cells/mL (right-skewed distribution with mean values around 129 000 cells/mL) were similar (Tab. 2).

Reproduction

Reproduction traits on OP and IP farms were similar. Artificial insemination was performed in 79 and 73% of OP and IP farms, respectively. Median age at first calving was 28.0 mo (22.6–36.0 mo) for OP farms and 28.0 mo (23.0–34.4 mo) for IP farms. Median time to first service was 65 d (33–146 d) for OP farms and 68 d (28–133 d) for IP farms. Median time between parturition and pregnancy (days open) was 78 d (38–204 d) for OP farms and 81 d (35–209 d) for IP farms. The median number of services required to get cows pregnant before the start of the present study was 1.39 (1–2.3) times on OP farms and 1.39 (1–2.6) times on IP farms. Median conception rates of the first service were 74% (33–100%) for OP farms and 65% (12–100%) for IP farms. Median calving intervals were 366 d for both production types, ranging from 322 to 479 d.

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Table 2: Milk production data on 60 organic (OP) and 60 integrated (conventional) production (IP) Swiss dairy farms.

	Median and 2.5 – 97.5 percentile range		
Variables	**OP farms**	**IP farms**	**P-values**
Energy-corrected milk (ECM; kg/305 d)	5695 (4116–7588)	6059 (4036–8382)	0.002
Somatic cell count ($\times 10^3$ cells/mL)	118.7 (54.2–325.3)	117.5 (44.9–305.6)	0.78
Milk fat (g/kg)	38.7 (35.4–42.7)	39.2 (35.3–45.8)	0.16
Milk protein (g/kg)	31.8 (30.1–34.2)	32.7 (29.9–34.8)	0.01
Milk urea (g/kg)	21.1 (13.9–30.7)	22.0 (14.5–36.3)	0.11
Milk lactose previous lactation (g/kg)	49.1 (47.4–50.9)	49.4 (47.4–50.5)	0.25
Persistency (% change in kg ECM from 101 – 305 d vs. 1 – 100 d of lactation)	79.2 (63.4–89.0)	81.8 (66.5–87.8)	0.35

For interval-measured cow parameters, farm-level means were calculated and compared between types of farms. P-values were derived in a repeated measures (matched) ANOVA routine

Animal health management

There were no significant differences in the management of prophylactic or therapeutic measures taken in case of acute and chronic mastitis, parturient paresis, rumen acidosis, claw diseases, and retained placenta/endometritis. However, cases of clinical ketosis were treated more often ($P < 0.01$) by IP (21 times) than by OP farmers (7 times). The preferential treatment for clinical ketosis on IP farms was propylenglycol. Alternative veterinary methods (homeopathy, herbal medicine, acupuncture) were used for most or at least part of treatments in 55 and 17% of the OP and IP farms.

Discussion

This is the first comparative study between OP and IP Swiss dairy farms. Farms were located in lowlands, the hill and mountain regions of the canton of Bern, i.e., in zones that are also found in other Swiss regions of Switzerland. Average farm size of selected farms was close to the Swiss national average and based on the selection procedure farms represented Swiss dairy farming characteristics.

Almost 85% of the OP farms in our study produced under the guidelines of organic farming for < 10 years. Because a minimum of 3 years of organic production was an inclusion criterion for our study, we assume that the selected OP farms were representative for Swiss organic dairy farming in general. The voluntary participation of all farmers might have resulted in selection bias. The direction of the bias can be debated controversially since there were several reasons for farmers to participate or not to participate in this study. Due to our inclusion criteria, all farms were members of breeding organizations. This was required in order to receive detailed information on milk yield and milk components. Results from this study might not be representative for very small farms (< 5 cows). On OP farms a lower number of cows per ha of agricultural land was held than on IP farms. One of the reasons might be a lower yield of that agricultural land (Mäder et al., 2002) and higher costs for purchasing organically produced feeds. Non-significantly more OP than IP farms housed cows of the Simmental x Red Holstein breed, whereas non-significantly more IP than OP farms housed cows of the Holstein breed. The breed distribution (Roesch et al., 2005) on OP and IP farms was similar (Simmental x Red Holstein: 55.1 and 49.1%; Holstein: 19.7 and 26.1%; Simmental: 18.8 and 19.3%: other breeds: 6.4 and 5.5%). Due to restrictions in feeding, especially with concentrates, OP farms might have difficulties to fulfill the nutrient requirements of purebred Holstein cows.

The OP and IP cows had a similar age and the same median parity number. Main causes of cow replacements in OP and IP farms were mastitis, followed by fertility problems and insufficient milk yield, in agreement with studies in Swiss conventional farms (Danuser and Gaillard, 1990). There were no significant differences between OP and IP farms in cow replacement rates in the present study except due to mastitis. This finding that was in contrast to Augstburger et al. (1988). The enhanced replacement due to

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mastitis on OP farms may have been in part the consequence of a reduced possibility to treat these cases with antibiotics. Fertility disorders as the main cause for replacement in both groups were in agreement with results of Augstburger et al. (1988) and Krutzinna et al. (1996a).

Loose housing systems were more than twice as often seen on OP than IP farms, likely because on OP farms it is only exceptionally allowed to tie animals (Fuhrer, 2004). There was a significantly higher number of OP than IP farms that had outside walking yards for cows. More outdoor access during the winter season, in both OP and IP farms was associated with increasing milk yield (Roesch et al., 2005). Of all IP farms, most used a tethering system that was combined at least temporarily with an electric cow trainer. Instead of electric cow trainers flexible mechanical arrangements were used in 37% of OP farms.

The higher number of bucket milking systems in tie stall barns, but lower high line milking systems in OP than IP farms was consistent with previous studies (Frei et al., 1997). Whereas 45% of all IP farms performed blanket antibiotic dry cow therapy, none of the OP farms used this type of prophylaxis against udder infections, in accordance with guidelines for organic farming (Fuhrer, 2004). Data on antibiotic resistance on studied OP and IP farms were recently published (Roesch et al., 2006). On OP farms the CMT was used less frequently to check the udder health than on IP farms. In our previous study on OP farms this was associated with a higher prevalence of subclinical mastitis (Busato et al., 2000a). In the present study cow-level prevalences of subclinical mastitis at 31 and 102 d postpartum were similar (Roesch, Doherr, Schären, Schällibaum and Blum, unpublished observations)]. Post-milking teat dipping was performed more often on IP than OP farms. This had no obvious effect on SCC because SCC were similar on OP and IP farms, but was associated with higher milk yields (Roesch et al., 2005).

Lower milk yields on OP than IP farms agreed with other European studies (Augstburger et al., 1988; Krutzinna et al., 1997; Kristensen and Kristensen, 1998; Reksen et al., 1999; Hardeng and Edge, 2001; Zwald et al., 2004) and with a previous study in which yields in Swiss OP farms were lower than the Swiss average (Busato et al., 2000a). Significant differences occurred in all lactation periods except immediately before drying off. Interestingly, OP cows reached maximal daily milk yields during their sixth lactation, whereas IP cows already reached maximal yields during their third lactation and yields declined after the sixth lactation in OP cows, whereas IP cows maintained relatively high yields up to the seventh lactation (Roesch et al., 2005), possibly reflecting better genetics and (or) nutrition of IP than OP cows. Reasons for lower ECM yields in OP than IP farms have been discussed in detail (Roesch et al., 2005). The similar persistency of lactation in OP and IP farms was in contrast to Kristensen and Kristensen (1998) who found a higher persistency on OP than IP farms. Median values of milk fat, lactose, protein and urea concentrations were within the normal range and comparable with findings reported by Braun et al. (1983) for Swiss Brown cows. The slightly lower milk protein contents on OP than IP farms might have been due to lower energy and (or) protein intake of cows on OP farms, as suggested by Trachsel et al. (2000) and in agreement with Scholl (1992). The SCC were at a low level in both OP and IP farms.

Regarding fertility, there were no significant differences in the number of services per conception, days to first service, days open, days from first service and conception and calving intervals between OP and IP farms. This was in contrast to Reksen et al. (1999), who found more days open, a longer calving interval, longer intervals from calving to first and last service, and a higher number of services per conception on OP than IP farms. In a study on Swiss high-yielding cows (that included lower yielding control cows) the number of services per conception and days open were higher than in the present study (Aeberhard et al., 2001). The number of services per conception was below the aimed value of 1.6 (Ewy et al., 1992). A lower calving interval on OP than IP farms in a German study (Krutzinna et al., 1997) was not confirmed in the present study. Despite the recommended guidelines that the artificial insemination on OP farms should be used restrictively, the percentage of artificial insemination surprisingly was higher on OP than IP farms.

There were differences in available feeds during summer and winter, as expected. There were numerical, but surprisingly no significant differences with respect to available feeds, feeding planning and feeding management between OP and IP farms. Separate feeding of dry cows, start of concentrate feeding prepartum, allocation of concentrates according to performance, use of automatic feeding, feed mixers, and provision of total mixed rations were similar in OP and IP farms, but OP farms provided less concentrates than IP farms, less protein supplements (1 and 0.5 kg/cow/day, respectively) and less roughage containing predominantly legumes and beets and rapeseed or soy extraction meals during winter (Roesch et al., 2005).

Health management was comparable on OP and IP farms, but OP farmers used more often alternative methods to treat mastitis than IP farmers. On OP farms measures to prevent ketosis (on IP farms mainly by propylenglycol) were used less often than on IP farms. This might have been due to a lower percentage of problems with metabolic diseases on OP than IP farms. In a Norwegian study ketosis frequency on OP farms was only one third of that on

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conventional farms (Hardeng and Edge, 2001) and other studies, too, recorded a low incidence of ketosis on OP farms (Weller and Cooper, 1996; Krutzinna et al., 1996b).

In conclusion, this study shows differences between OP and IP farms in housing systems, some aspects of milking systems and management, milk production, milk protein content and use of alternative veterinary treatments, but there were surprisingly small differences observed with respect to available feeds, planning and management of feeding, and in the studied reproduction traits. Thus, in the studied Swiss dairy farm population only few significant differences existed between organic and integrated production farms.

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Gestion, alimentation, production, reproduction et santé mammaire dans des exploitations laitières suisses biologiques et conventionnelles

Des exploitations en production biologiques (OP; n=60) et en production intégrée conventionnelle (IP; n=60), équivalentes du point de vue taille, localisation et zone (altitude) ont été examinées quant à d'éventuelles différences de gestion, d'alimentation, de production, de reproduction et de santé mammaire. Les exploitations OP et IP étaient similaires quant à leur taille (17,7 et 16,9 ha), leur contingent laitier (65 900 et 70 000 kg par année), le nombre de vaches (14 et 15), l'age des vaches (5.3 et 5.2), la garde de vaches des races Simmental × Red-Holstein et Holstein (87 et 75% ; 45 et 60%). Elles se différenciaient par contre de façon significative quant à la détention en stabulation libre (18 et 7%), la sortie (98 et 75%), la production laitière corrigée à 305 jours (5695 et 6059kg), le taux de protéines (31,8 et 32,7 gr/kg), l'observation d'intervalles de traite réguliers (12heures) (47 et 68%), l'usage régulier du test de Schalm (10 et 28%), le trempage régulier après la traite (25 et 43%) et le tarissement de routine avec des antibiotiques (0 et 45%). Les taux de cellules dans les exploitations OP et IP (119 000, respectivement 117 000 par ml) ainsi que les taux de fertilité étaient similaires et il n'y avait pas de différence significative entre les exploitations OP et IP pour ce qui est des fourrages disponibles, du plan et de la gestion de l'affouragement. Des traitements vétérinaires alternatifs étaient plus fréquemment utilisés sur les exploitations OP que IP (55 et 17%). Les raisons principales de réforme des vaches dans les 2 types d'exploitations étaient les problèmes de fécondité (45%) pour les 2), l'âge (40 et 42%), la vente (30 et 37%) et la santé mammaire (35 et 13%). On a trouvé peu de différences importantes entre les 2 types d'exploitations.

Management, foraggiamento, produzione, riproduzione e salute della mammella nelle aziende svizzere con bestiame da latta con produzione biologica o convenzionale

Sono state esaminate sulle possibili differenze sotto il profilo manageriale, di foraggiamento, di produzione, di riproduzione e di salute della mammella aziende con bestiame da latte con produzione biologica (OP organic production; n=60) e convenzionale (integrata) (IP integrated production; n=60) simili rispetto a dimensione, localizzazione e zona agricola (altezza s.l.m.). Le aziende OP e IP erano simili rispetto alle dimensioni (17.7 e 16.9 ha), contingente di latte (65 900 e 70 000 kg/anno), numero di mucche (14 e 15), età delle mucche (5.3 e 5.2 anni), tenuta di razze di mucche Simmental × Red Holstein e Holstein (87 e 75%; 45 e 60%), si differenziavano però fortemente sotto l'aspetto della tenuta in stalla libera (18 und 7%), movimento (98 e 75%), 305 giorni produttività lattiera corretto per l'energia (ECM) (5695 e 6059 kg), contenuto di proteine del latte (31.8 e 32.7 g/kg), percentuale impianti di mungitura (73 und 33%), rispetto regolare dell'intervallo di mungitura (12 h) (47 e 68%), utilizzo di routine del test California-Mastite (10 e 28%), immersione regolare dei capezzoli dopo la mungitura (25 e 43%) e regolare periodo di asciutta con antibiotici (0 e 45%). Il numero delle cellule nelle aziende OP e IP (119 000 risp. 117 000/mL) e i risultati della fertilità erano simili e non sono state rilevate differenze significative rispetto alla disponibilità di mezzi di foraggio. pianificazione del foraggio e management del foraggio. Per quel che riguarda i procedimenti terapeutici veterinari alternativi, questi vengono utilizzati più di frequente nelle aziende IP (55 und 17%). Motivo principale di una rimonta degli animali nelle aziende OP e IP erano problemi di fertilità (entrambe 45%), età (40 e 42%), vendita (30 e 37%) e salute della mammella (35 e 13%). Tra le aziende OP e IP si sono riscontrate differenze relativamente piccole.

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