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and net return to management as feed prices and the percentage of corn land double cropped changed. Farm simulations were done using the Integrated Farm System Model (IFSM) and crop, dairy, and financial data from 3 dairy farms that practiced double cropping in Pennsylvania during 2016 and 2017. Farms ranged from 336 to 511 ha with 233 to 663 cows. Farms were simulated over a 20-year time period using weather data from DuBois, Pennsylvania. Eight scenarios measuring intensity of double cropping and change in feed price for each farm were simulated. These included: current operation, 0, 50, and 100% of corn land double cropped, 30% relative feed price increase with and without double cropping, and 30% feed price decrease with and without double cropping at current operation level. Double cropping 100% compared with 0% of corn land improved total DM yield by 19% while reducing annual N leached and P runoff losses by an average of 4.5% and 9.2%, respectively, across farms. Double cropping provided a 1.3 and 1.8% increase in net return over feed costs and net return to management, respectively, across farms. When feed prices increased 30%, use of double cropping increased net return over feed cost and net return to management by 1.6 and 2.2%, respectively, across farms. When feed prices decreased by 30%, double cropping increased both net return over feed cost and net return to management by 0.1%, averaged over all farms. Simulation with the IFSM showed that use of double cropping improved profitability on farms during times of average to high feed prices. Loss of N and P decreased with double cropping, but use of N fertilizer with winter annuals reduced this benefit.

Key Words: profitability, environment, double cropping

M138 Effect of different water source manner on performance and social behavior of dairy calves after weaning. J. Broucek*[1], M. Uhrincat[1], P. Kisac[1], A. Hanus[1], and M. Soch[2], [1]*National Agricultural and Food Centre, Research Institute of Animal Production Nitra, Luzianky, Slovakia,* [2]*South Bohemia University, Ceske Budejovice, Czech Republic.*

The goal of the study was to find impact of water receiving method on the growth, health, and cross-sucking of calves. Sixty-three calves were kept in hutches to weaning at the age of 8 weeks. The experiment lasted from April to November. Calves drink mothers milk ad libitum from a bucket with nipple from d 2 to 4. From d 5, they received 6 kg of milk replacer per day divided into 2 portions, concentrate and alfalfa hay ad libitum. Calves were divided according to the water delivery into 3 groups: nipple sucking from bucket (A), drinking from bucket (B), and without delivery water (C). Feed and water refusals were removed and weighed. Blood samples for analysis of white and red blood pictures were taken every week. The methods of Larson (1977) for the evaluation of diarrhea and respiratory condition were used. After weaning the calves were moved to loose housing pens. Their social behavior was observed until the age of 6 mo individually. The data were analyzed using an ANOVA. We not found significant difference among groups in the average daily gains and feed intakes. Daily gains were the highest in group A (A 0.46 kg, B 0.43 kg, C 0.43 kg). A group of calves drank up more water to the weaning than B group (69.39 kg vs 50.72 kg), and group A had the highest intake of starter mixture (A 14.43 kg, B 11.30 kg, C 13.31 kg). The highest alfalfa hay consumption was found in group C (A 21.34 kg, B 22.26 kg, C 23.59 kg). Neither calf died or was culled for bad health. There were no water delivery effects for blood measurements. The faces had liquid consistency during the first weeks, rather than a firm one. Color showed a steadily trend from yellow to green and consistency changed smoothly from liquid to normal. We did not find significant differences between groups in the cross-sucking after weaning. The willingness to be sucked was the highest in calves from group A ($P < 0.001$). The results did not show a negative effect of water shortage. However, we cannot recommend the water intake just as part of the milk replacer on the basic of this experiment. This study was funded by APVV 15-0060 and QK1910438.

Key Words: calf, growth, water drinking.

M139 Association between age at first calving and productive performance in Argentinian dairy herds. P. Turiello*[1], C. Vissio[1,3], A. Larriestra[1], and J. Heinrichs[2], [1]*Universidad Nacional de Río Cuarto, Río Cuarto, Córdoba, Argentina,* [2]*The Pennsylvania State University, University Park, PA,* [3]*Conicet, Buenos Aires, Argentina.*

The aim of this study was to describe the distribution of age at first calving (AFC) in dairy herds of Córdoba province and to evaluate the effect of AFC on productive indicators during the first lactation. A retrospective study was used to analyze data from 26,614 cows calved for the first time during the calendar year 2016. A total of 15,181 first-lactation cows were included in the analysis. Registers were stratified by age at first calving (AFC) into 5 groups: 1) 18–21 mo, 2) 22–25 mo, 3) 26–29 mo, 4) 30–33 mo, 5) 34–37 mo. Milk yield (MY) for first lactation cows having at least 5 milk test days was used to analyze production. The General Linear Mixed Models was applied to determine differences in start-up, peak and daily mean milk yield. The fixed effects evaluated were AFC category, calving season and herd size category, herd was fitted as a random effect. The effect of AFC on milk production during the 5 milk test days was evaluated including the random effect of cow nested within farm. The overall median and interquartile range (IQR) of AFC was 27 and 25–30 mo, respectively. Median milk yield per heifer was 27.1 kg/d (IQR = 23–31). MY, start-up and peak milk yield increased systematically from the 1st to the 5th AFC category (Table 1). Milk production adjusted by herd size and calving season for the 5 AFC categories showed lower MY for lower AFC categories at the beginning of the lactation but differences between AFC categories 3, 4

Table 1 (Abstr. M139). Estimates (mean ± SE) of productive indicators according to AFC category[1]

	1	2	3	4	5
N	202	5,569	5,579	2,389	1,442
Milk yield (MY) (kg/d)	23.0 ± 0.47[a]	24.7 ± 0.33[b]	25.3 ± 0.33[c]	25.8 ± 0.33[d]	26.5 ± 0.34[e]
Start-up MY (kg)	19.6 ± 0.56[a]	21.4 ± 0.30[b]	22.0 ± 0.29[c]	22.4 ± 0.31[d]	22.9 ± 0.33[d]
Peak MY (kg)	26.4 ± 0.51[a]	28.6 ± 0.36[b]	29.3 ± 0.36[c]	29.9 ± 0.37[d]	30.9 ± 0.38[e]

[a–e]Different letters within a row indicate significant difference at $P < 0.05$.

[1]AFC (age at first calving) categories: 1) 18-21 mo, 2) 22-25 mo, 3) 26-29 mo, 4) 30-33 mo, 5) 34-37 mo.

and 5 disappeared by the 4th test day. In conclusion, opportunities exist to reduce AFC, not much affecting MY and reducing rearing costs in dairy herds of Córdoba province.

Key Words: age at first calving, milk yield

M140 Effect of fan and showering on physiological responses and reproductive performance of Holstein Friesian bulls during subtropical summer. M. Q. Shahid*[1], M. A. Butt[1], J. A. Bhatti[2], and A. Khalique[3], [1]*Department of Livestock Production, Ravi Campus, University of Veterinary and Animal Sciences, Lahore, Pakistan,* [2]*Department of Animal Sciences, College of Veterinary and Animal Sciences, Jhang, Pakistan,* [3]*Department of Animal Nutrition, University of Veterinary and Animal Sciences, Ravi Campus, Lahore, Pakistan.*

The objective of current study was to determine the effect of fan and showering on physiological responses and reproductive performance of Holstein Friesian bulls during subtropical summer in Pakistan. Thirty-six Holstein Friesian bulls balanced by age and weight were divided into 3 treatment groups. The treatments were: 1) CTL, bulls kept under shade only; 2) FN, bulls provided with fans under shade, and 3) FNS, showering along with fans under shade. The trail lasted for 6 mo from April, 2016 till September, 2016, divided into 2 seasons (dry hot and humid hot). The observations on ambient temperature, relative humidity, temperature-humidity index, DMI, water intake, rectal temperature (RT), pulse rate (PR), and respiration rate (RR) were taken daily and converted to weekly averages. Semen characteristics and selected blood metabolites were measured fortnightly. The data were subjected to ANOVA using Proc Mixed of SAS. The results indicated that DMI of bulls was similar between the treatment groups. Mean weekly water intake, RT, PR, and RR were significantly lower in FNS group compared with CTL and FN ($P < 0.001$). Semen characteristics including semen concentration, post-thaw semen motility, progressive motility, amplitude of lateral head displacement, straightness, live to dead ratio, plasma membrane integrity, normal acrosomal ridge and DNA integrity were not different between the treatment groups ($P > 0.05$). The FNS group tended to have higher semen volume compared with FN and CTL groups ($P = 0.10$). Blood glucose level was significantly lower in FNS compared with FN and CTL group ($P < 0.05$). Blood urea nitrogen and testosterone were not different among the treatment groups ($P > 0.05$). The current results indicated that showering with fans improved welfare of Holstein Friesian bulls by lowering physiological responses along with minor gain in semen volume during subtropical summer.

Key Words: heat stress, showering, bull performance