Production, Management, and the Environment IV

690   Comparison of four beef production systems on carcass characteristics. Jefferson McCutcheon*, Steven Moeller, Henry Zerby, and Francis Fluharty, *The Ohio State University, Columbus, OH.*

The objective for the study was to compare novel beef production systems to determine the effects of 3 grass finishing regimens on carcass characteristics. This experiment was conducted at 3 research stations in Ohio over 5 yrs. The systems were: STOCK = calves born in March, weaned at 7 mo. of age, grazed in the fall, fed hay in the winter, and then grazed to 16 mo of age and slaughtered; DELAY = calves born in March, not weaned and slaughtered at 10 mo of age; FALL = calves born in September, fed hay when grazing was not possible and not weaned until slaughter in July; and FEED (control) = spring-born counterpart calves from each of the 3 research station locations weaned in October, transported to a feedlot, fed a 90% grain-10% forage diet until reaching 1.0 cm of backfat. All grass systems were conducted in all 3 locations in a randomized block experimental design (blocked by location). Each location had 12 calves and respective cows for each system. Statistics were run using SAS Proc Mixed with PDIFF for mean separation. Slaughter weight was greatest for FEED (505.0 kg, SEM 6.6 kg), followed by STOCK (421.2 kg), FALL (334.2 kg) and DELAY (312.8 kg; $P < 0.05$). Hot carcass weight was greatest for FEED (299.9 kg, SEM 4.8 kg), followed by STOCK (218.4 kg), FALL (183.3 kg) and DELAY (163.7 kg; $P < 0.05$). Ribeye area was greatest for FEED (71, SEM 1.7 cm^2), followed by STOCK (57.5 cm^2), and FALL (52.3 cm^2; $P < 0.05$) with no difference between DELAY (51.5 cm^2) and FALL ribeye area ($P > 0.05$). Backfat was greatest for FEED (1.52 cm, SEM 0.05 cm; $P < 0.05$) while STOCK (0.58 cm) was not different from FALL (0.51 cm; $P > 0.05$) and greater than DELAY (0.40 cm; $P < 0.05$). Marbling scores were greatest for FEED (604 Modest, SEM 18; $P < 0.05$) with DELAY (495 Slight) being greater than STOCKER (427 Slight) and FALL (419 Slight; $P < 0.05$). Spring born calves weaned in the fall and placed on feed resulted in heavier carcasses, with greater muscling and back fat than grazing systems. Spring born calves, not weaned and slaughtered at 10 mo. produced a higher quality grade carcass than the other grazing programs. Leaner carcasses were produced from the grazing programs.

Key Words: beef, system, carcass

691   BeefTracker mobile app for tracking and analysis of beef herd pasture use and location. James W. Oltjen*, Larry C. Forero, and Jeffrey W. Stackhouse, *University of California, Davis, CA.*

We have developed a web-based mapping platform named "Beef-Tracker" to provide beef cattle ranchers a tool to demonstrate that cattle production fits within sustainable ecosystems and to provide regional data to update beef sustainability lifecycle analysis. After initial identification and mapping of pastures, herd data (class and number of animals) are input on a mobile device in the field with a graphical pasture interface, stored in the cloud, and linked via the web to a personal computer for inventory tracking and analysis. Pasture use calculated on an animal basis provides quantifiable data regarding carrying capacity and subsequent beef production to provide more accurate data inputs for beef sustainability lifecycle analysis. After initial testing by university range scientists and ranchers, we have enhanced the BeefTracker application to improve automation for increased ease of use. The following have been added: ability to access and edit the BeefTracker livestock inventory while disconnected from Wi-Fi and cell service; ability to represent portions of a pasture in BeefTracker as irrigated and non-irrigated; ability to report animal unit harvest (by pasture) calculated on an annual basis–this will provide quantifiable data regarding carrying capacity and subsequent beef production to provide more accurate data inputs for the beef sustainability lifecycle analysis; enhanced map synchronization; and improved security to allow a single individual to access multiple livestock operations without needing multiple user ids and passwords. We are now in the process of education to increase its use.

Key Words: cloud data storage, graphical interface, animal mapping

692   Effect of yearling beef steer frame score, grazing sequence, and delayed feedlot entry on steer performance, carcass measurements, and system economics. Songul Senturklu*[1,2], Douglas G. Landblom[1], Robert J. Maddock[3], and Steve I. Paisley[4], [1]*North Dakota State University, Dickinson Research Extension Center, Dickinson, ND,* [2]*Canakkale Onsekiz Mart Universitesi, Animal Science Department, Canakkale, Turkey,* [3]*North Dakota State University, Animal Science Department, Fargo, ND,* [4]*University of Wyoming, Animal Science Department, Laramie, WY.*

Ninety-six yearling beef steers divided into 2 frame score groups and identified as small frame score (SF: n = 48, Avg. 3.40; Range 1.58–4.13; 1/2RA × 1/4LO × 1/4AN) and large frame score (LF: n = 48; Avg. 5.31; Range 4.48–6.65; 1/2SM or 1/2SH × 1/4AN × 1/4RA) were randomly assigned to replicated pens or fields (3) on May 1 to evaluate an extended grazing and delayed feedlot entry system (GRAZ) compared with a feedlot direct (FLOT) system. Growing and finishing for the FLOT treatment and final delayed finishing of the GRAZ treatment steers was at the University of Wyoming (UW), SAREC feedlot, Lingle, WY. FLOT steers were on feed 216 d and GRAZ steers were on feed 74 d. GRAZ steers grazed a sequence of native range (113 d), pea-barley intercrop (30 d), and unharvested corn (77 d) before being moved to the UW-SAREC feedlot. Grazing and feedlot total days was 294 d. Data were analyzed using the MIXED procedure of SAS. For the GRAZ-LF and GRAZ-SF steers, grazing gain, ADG, pasture grazing cost, annual forage crop expenses, and grazing cost/kg gain was 243 kg, 1.10 kg/d, $285.05/steer, and $1.17/kg; 211 kg, 0.96 kg/d, $278.04, and $1.32/kg, respectively. Compared with the LF steers in the feedlot, SF steers grew slower, consumed less feed, were equally efficient, but feed cost/kg of gain was higher. HCW for SF steers was lighter, and marbling score was greater for SF steers (Table 1). LF steer carcass value was greater and system net return was greater for the LF frame steers (Table 1). Managing grazing cost and delaying feedlot entry reduced DOF and enhanced LF and SF GRAZ system profitability.

Contd.

Table 1 (Abstr. 692). Performance data for beef steers

Item	FLOT-LF	FLOT-SF	GRAZ-LF	GRAZ-SF	SE	*P*-value
Days on feed	216	216	74	74		
Gain, kg	343	288	159	140	5.56	0.0001
ADG, kg	1.59	1.33	2.15	1.89	0.035	0.0001
DM feed/ steer/d, kg	9.39	8.62	12.18	10.76	0.37	0.002
DM feed/kg gain, kg	5.90	6.46	5.70	5.70	0.30	0.52
Feed cost/kg gain, $	1.88	2.07	1.38	1.39	0.018	0.001
HCW, kg	367	318	374	328	10.6	0.001
Fat depth, cm	0.89	0.99	0.64	0.82	0.074	0.05
REA, sq cm	82.6	74.8	81.3	74.8	1.35	0.004
YG	2.0	2.2	1.91	2.2	18.54	0.11
Marbling score	578	624	552	615		0.08
Carcass value, $	1,728.55	1,515.66	2,004.38	1,763.68	57.25	0.0005
System net return, $	67.95	−1.62	500.65	350.08		

Key Words: frame score, delayed feedlot entry, grazing system

693   Housing and management practices on farms using automated calf feeders in the Midwestern United States. Matthew Jorgensen*[1], Amber Adams Progar[1], Kevin Janni[1], Hugh Chester-Jones[2], Jim Salfer[3], and Marcia Endres[1], *[1]University of Minnesota, Saint Paul, MN, [2]University of Minnesota Southern Research and Outreach Center, Waseca, MN, [3]University of Minnesota Extension, Saint Cloud, MN.*

Automated calf feeding systems are growing in popularity across the United States, yet information regarding feeder use and management is limited. This ongoing study is investigating housing and management practices on dairy farms with automated feeders. Thirty-eight Midwestern dairy farms were visited approximately every 60 d for 18 mo. Management practices data were collected using a questionnaire and calves (n = 10,185) and facilities were observed by research personnel. Of 38 calf feeding facilities, 39% were specifically constructed to house automated feeders and 61% were retrofitted; 53% were naturally ventilated barns, 39% were mechanically ventilated, and 8% were within a tunnel ventilated barn. A great majority of facilities (84%) supplemented ventilation systems with positive pressure tubes. Mean (±SD) pen size available to calves was 72.1 (±33.0) m^2. Farms housed 17.6 (±7.8; range 2–63) calves per pen, allowing for 4.6 (±2.9; range 1.2–32.3) m^2 of space/calf and 16.7 (±6.6; range 2–38) calves per nipple station. Calves were introduced into group pens at 5.2 (±4.0; range 0–14) days of age. A total of 68% of farms fed calves reconstituted milk replacer, 24% whole milk plus replacer or protein balancer, and 8% unsupplemented whole milk. A medicated milk product was used by 76% of farms. Milk (or replacer) allowance per day at feeder introduction was 5.4 (±2.1; range 3–15) L rising to 8.3 (±2.0; range 5–15) L at its peak. Time from feeder introduction to peak milk allowance was 18.0 (±11.4; range 0–44) days. Weaning for calves on automated feeders started at 44.5 (±6.9; range 32–60) days of age and calves were fully weaned by 56.8 (±9.0; range 40–86) days. Management of automated feeding systems was highly varied among farms in this study and an investigation of the relationship between management factors and calf morbidity and mortality will provide an understanding of factors associated with improved calf performance and welfare. This project is supported by Agriculture and Food Research Initiative competitive grant no. 2012–67021–19280 from the USDA National Institute of Food and Agriculture.

Key Words: automated feeder, calf management, calf housing

694   Effect of calving interval on the economic results of dairy farms based on their typology. Anne-Catherine Dalcq*[1], Yves Beckers[1], Patrick Mayeres[2], Benoit Wyzen[2], and Hélène Soyeurt[1], *[1]Université de Liège-Gembloux Agro-Bio Tech, Gembloux, Belgium, [2]Walloon Breeders Association, Ciney, Belgium.*

The calving interval (CI) can influence the milk production (MP) and the economic results of a farm. This research aimed to highlight the most economically important CI, on the basis of the accounts of breeders. The data set contained 1,318 accounts spread between 2007 and 2012. Technical information such as mean CI of the herd, percent of cows with a CI of less than 380 d (m380), between 380 and 419 d (e380419), between 420 and 459 d (e420459) and more than 459 d (p459), mean MP of the herd; as well as typological information such as quantity of equivalent concentrate (CC), number of ares of grass (GR) and of corn silage (CS) per livestock unit (LU); and economic information such as mean gross margin per cow were available. The relation between CI and the gross margin showed that if a single economic optimum of CI cannot be determined, this optimum could depend on the typology of the farm. Therefore, 4 groups were created by using a multiple correspondence analysis, including quantity of equivalent CC, number of ares of GR and of CS per LU as variables. The first group was the most intensive one with a feeding based mostly on CC and CS; the second group was similar but less intensive. The third group was the most extensive with high GR consumption. The fourth group was characterized by a near absence of CS but more CC. Moreover, m380, e380420, e420459, p459 were transformed from quantitative to qualitative variables by using numerical classification. A qualitative variable CI profile was created as a summary of all these variables. In each group, MP was modeled using the different CI variables. The assumption behind this modeling was that for a typological profile, the breeder must have the highest MP to maximize the gross margin. These models showed that MP is maximized when p459 is lower than 26%, lower than 37%, above 27% for the group 1, 2, 3 respectively. For the group 4, the model with the variable CI profile suggested that the economic optimum of CI is intermediate. These results underlined that the economic optimum of CI is related to the typology of the considered farm. Studying individual data is a perspective to determine more precisely CI with the best economic results.

Key Words: calving interval, milk production, economic results

695   Evaluation of winter housing systems for effects on production, udder health, BCS, hygiene, frostbite, and rumination of organic dairy cows. Lucas S. Sjostrom*[1], Bradley J. Heins[1], Marcia I. Endres[2], Roger D. Moon[2], and Ulrike S. Sorge[2], *[1]University of Minnesota, West Central Research and Outreach Center, Morris, MN, [2]University of Minnesota, Saint Paul, MN.*

Certified-organic cows (n = 165), according to the USDA-National Organic Program rules, were used to evaluate the effect of 2 winter housing systems (December to April) on production, SCS, body weight, BCS, incidence of frostbite, and rumination. Cows were assigned to 2 treatments (2 replicates per group): (1) outdoor (straw pack, n = 81) or (2) indoor (3-sided compost-bedded pack barn, n = 84). There were 21 cows per replicate per year for the outdoor housing and 21 and 20 cows per replicate per year for the indoor housing. Cows calved during 2 seasons (spring or fall) at the University of Minnesota West Central

Research and Outreach Center, Morris, Minnesota, organic dairy. Milk, fat and protein production and SCS were recorded from monthly DHIA testing. Hygiene scores and BCS were recorded bi-weekly as cows exited the milking parlor. Frostbite incidence was collected monthly in year 2. The PROC MIXED of SAS was used for statistical analysis, and independent variables were fixed effects of year of study, season of calving (fall or spring), parity (1, 2, 3+), breed group, housing system, with replicate and cow nested within the interaction of housing system and season of calving as a random effect. Energy-corrected milk and SCS were not different for the indoor (15.8 kg/d, 2.75) and outdoor (15.5 kg/d, 2.88) housing systems. The BCS (3.38 for indoor cow vs. 3.08 for outdoor cows) within housing systems were not different. Indoor cows had greater ($P < 0.05$) udder hygiene scores (1.73 vs. 1.45) and greater ($P < 0.05$) abdomen hygiene scores (1.86 vs. 1.56) compared with outdoor cows. Incidence of clinical mastitis was greater ($P < 0.05$) in indoor cows compared with outdoor cows (30% vs. 13%). Frostbite incidence was not different between indoor (34%) and outdoor (21%) cows ($P = 0.14$). Daily rumination was 495 min/d for indoor cows and 474 min/d for the outdoor cows ($P = 0.12$). In summary, cows housed outdoors on straw-bedded packs did not differ from cows housed in an indoor compost-bedded pack barn for production and SCS; however, the indoor cows were dirtier and had reduced udder health compared with outdoor cows.

Key Words: organic, outwintering, compost barn

696   Risk factors for abnormal calf health scores on farms using automated feeders in the Midwest USA. Matthew Jorgensen*[1], Amber Adams Progar[1], Sandra Godden[1], Hugh Chester-Jones[2], Anne Marie de Passillé[3], Jeff Rushen[3], and Marcia Endres[1], [1]*University of Minnesota, Saint Paul, MN, [2]University of Minnesota Southern Research and Outreach Center, Waseca, MN, [3]University of British Columbia, Vancouver, BC, Canada.*

Automated calf feeding systems are growing in popularity across the United States, yet research identifying risk factors that influence calf health is limited. This ongoing study is investigating associations between farm management, environment and housing with calf health outcomes. Thirty-eight Midwestern dairy farms were visited approximately every 60 d for 18 mo. During each visit calves (n = 10,185) were scored by a single observer for health outcomes including attitude, secretions of the ears, eyes and nose, and cleanliness of the rear end as evidence of diarrhea (0 = normal, clean calf – 58.1% of the scores; 1 = moderate coverage of loose feces – 32.4%; 2 = significant coverage of watery fecal material – 9.4%). Risk factors for higher cleanliness score (diarrhea) were assessed using multilevel ordinal logistic regression. Variables in the analysis included pen size, group size and stocking density, farm's colostrum management, and milk diet type, amount, formulation, and bacterial count. Non-significant variables were removed using backward elimination. Variable retention was set at $P < 0.05$. The association between season and cleanliness score was found to be highly significant. Odds ratios indicated that winter 2012–13 (0.78), spring 2013 (0.43), summer 2013 (0.54), fall 2013 (0.72), and spring 2014 (0.47) were all associated with reduced likelihood of diarrhea compared with winter 2013–14. Each liter increase in peak milk allowance was associated with an 11.6% decrease in odds of higher score or diarrhea (OR 0.88, $P = 0.001$). The number of days taken to reach peak milk allowance was also associated with higher score (OR = 1.02, $P = 0.006$). Increasing number of calves per group was associated with a small decrease in score or less diarrhea (OR = 0.99, $P = 0.04$). The magnitude of association observed for greater peak milk allowance suggests that feeding calves on a higher plane of nutrition, and reaching that plane earlier, may be beneficial in reducing observed diarrhea. This project is supported by Agriculture and Food Research Initiative competitive grant no. 2012-67021-19280 from the USDA National Institute of Food and Agriculture.

Key Words: automated feeder, calf health, calf nutrition

697   Management characteristics of cow-calf, stocker, and finishing operations in the North and South Plains. Senorpe Asem-Hiablie*[1], C. Alan Rotz[1], Robert C. Stout[1], Jasmine A. Dillon[2], and Kimberly R. Stackhouse-Lawson[3], [1]*USDA-ARS PSWMRU, University Park, PA, [2]The Pennsylvania State University, University Park, PA, [3]National Cattlemen's Beef Association, Centennial, CO.*

Regional surveys of cow-calf, stocker, and finishing operations are being conducted nationwide to gather information on cattle, crop, and range management practices needed for a comprehensive life cycle assessment (LCA) of beef production in the United States. The South Plains (Kansas, Oklahoma, and Texas) and the North Plains (Nebraska, South Dakota, and North Dakota) make up 2 of 7 regions demarcated for the LCA and are the focus of the present study. A total of 633 ranch responses represented 1.4% of the beef cows maintained across both regions, with 0.9 and 2.8% represented in the South and North Plains, respectively. Notable differences in management practices among cow-calf and stocker ranches in both regions were observed. Mean stocking rates decreased from the wetter east to the drier, semi-arid west. In the South Plains, mean stocking rates decreased from 2.4 ha/cow (1.3 ha/stocker) in the east to 15.7 ha/cow (4.6 ha/stocker) in the west and the North Plains reported 2.9 ha/cow (1.9 ha/stocker) in the east and 6.7 ha/cow (4.3 ha/stocker) in the west. Differences in forage management influenced by varying soil morphology and rainfall patterns, showed decreasing fertilizer and lime use from east to west in both regions. A higher percentage of ranches in the North Plains (57%) produced a variety of feed crops including corn and alfalfa to feed cattle compared with 17% in the South Plains. Although the proportion of ranches that harvested rangeland as hay were similar at 42% and 47% in the South and North Plains, respectively, the portion of land harvested was lower in the South (2.5%) than in the North Plains (13%). Responses from 60 feedyards represented 9% of cattle finished in the South Plains, 4% in the North Plains, and 7.5% overall. The primary difference in feedyard management identified across regions and among states was size. Feedyard capacities increased from north to south with the largest located in Texas. The data collected are being used to develop representative operations in each state to serve as basis for a comprehensive national LCA studying the environmental, economic, and social impacts of beef production and to identify opportunities for improvement.

Key Words: beef production, sustainability, life cycle assessment