Finishing Steers in a Deep-bedded Hoop Barn and a Conventional Feedlot: Effects on Performance and Carcass Characteristics during Winter in Iowa

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Summary and Implications

As the Iowa beef industry invests in environmental management, there has been increasing interest in systems that minimize runoff. A possible housing option used previously for pigs and sheep to help mitigate some of these environmental concerns are hoops. The objective of this study was to compare steer performance and carcass characteristics between two housing treatments; hoop confinement barn (HP n=3; 4.65m^2/steer) vs. conventional feedlot (FD n=3; 14.7m^2/steer). A total of 240 crossbred *Bos taurus* steers were used. Steers were ear tagged, implanted, and weighed (400 ± 23.38 kg) on arrival and allotted to balance weight and breed. Performance measures; average daily gain (ADG), average daily feed intake (ADFI), and feed to gain ratio (F:G) were collected over the trial. Carcass characteristics; dressing percentage, hot carcass weight (HCW), fat depth over the 12rd rib, kidney pelvic and heart fat (KPH), ribeye area (REA), marbling score, quality grade, and USDA yield grade were collected at processing by the packing plant. ADG, ADFI and F:G did not differ (P > 0.05) between housing treatments. Dressing percentage (P = 0.02) and HCW (P = 0.01) were higher for HP steers vs. FD steers between housing treatments. All other carcass characteristics did not differ (P > 0.05) between housing treatments. Therefore, housing steers in a hoop does not result in detrimental alterations in either performance or carcass characteristics when compared to steers in a conventional feedlot.

Introduction

As the Iowa beef industry invests in environmental management, there has been increasing interest in systems that minimize runoff. One example of such a facility is the deep-bedded hoop barn. To date there is limited information on feeding beef cattle in deep-bedded hoop barns and other housing systems for beef cattle. The objective of this study was to compare steer performance and carcass characteristics between two housing treatments; hoop building (HP) vs. a conventional feedlot (FD) during the winter months (January to April 2007).

Materials and Methods

Animals and Timeline. Two hundred and forty crossbred *Bos taurus* steers were used. Steers were ear tagged, implanted, and weighed (400 ± 23.38 kg) on arrival and allotted to balance weight and breed. All steers were fed a diet of 74.2% dry whole shelled corn, 15% ground hay, 3.3% protein pelleted supplement, 300 mg/hd/d monensin,, and 7.5% added water. Steers had ad libitum water access from one drinker/pen. Corn stalks were provided to HP steers for bedding. The trial was conducted from January to April 2007 and the project was approved by the IACUC committee of Iowa State University.

Treatments. Two housing treatments were compared. Treatment one; ***Hoop building*** (HP; n = 3 pens). Pen dimensions were 12.2 m wide by 15.2 m long. The hoop building was oriented lengthwise in a north / south orientation. The roof material was composed of a polyvinyl tarp stretched over arched supports in a Quonset^R design. The roof was set on 3.05 m tall wood posts which provided a total height of 7.92 m. The north and south ends were left open and the west wall was covered in tongue-in-groove planking for wind and sun protection. The east wall was left open with a 0.5 m high by 12.2 m long by 0.91 m wide concrete feedbunk along its length. A concrete pad extended 4.3 m from the bunk. A driveway along the east exterior provided access for a feed wagon. Water bowls were located next to the bunk along the pen dividers (Figure 1). Space of 4.65m^2/steer was provided.

Figure 1. Hoop barn.

Treatment two; ***Conventional feedlot*** (FD; n = 3 pens) was an open air feedlot. Pen dimensions were of 12.2 m wide by 48.2 m long. A 0.5 m high by 11.9 m long by x 0.91 m wide feedbunk was located at the north end of the pen, with a concrete pad extending 10 m from the bunk. Water bowls were located next to the pen divider 7 m from the feedbunk. A metal open-front building covered 7.6 m of

the north end of all the pens, with a drive-through alley for feed wagon access. The north wall of the building was equipped with adjustable polyvinyl curtains to allow air flow regulation, and the south wall was open. Space of 14.7m^2/steer was provided (Figure 2).

Figure 2. Conventional feedlot.

Performance Parameters. Average Daily Gain (ADG), Average Daily Feed Intake (ADFI), and Feed: Gain (F:G) was collected using the steers weight (kg) taken at first and final weigh (d 1 and 92, respectively) of steers and using the average weight gain of the steers from start weight to final weight.

Carcass Characteristics. All carcass characteristics were collected by the packing plant. These included the dressing percentage, hot carcass weight (HCW), fat depth over the 12rd rib, kidney, pelvic and heart fat, (KPH) ribeye area, (REA) marbling score, quality grade, and USDA yield grade.

Statistical Analysis. ADG was analyzed using Proc Mixed (SAS®) for parametric data. The experimental unit was the pen (n = 3). Two housing treatments were compared; the hoop (HP) vs. the conventional feedlot (FD). The statistical model included treatment, and a cubic covariate of start weight. The error term was pen nested within treatment. ADFI and F:G was analyzed using Proc Mixed of SAS®. The experimental unit was the pen (n = 3). The statistical model included the effect of treatment. Carcass characteristics except quality grade were analyzed using Proc Mixed (SAS®) for parametric data. Statistical model included treatment. The error term was pen nested within treatment, and a covariate of final weight. Quality grade was analyzed using Proc Glimmix (SAS®) for non-parametric data. The experimental unit was the individual steer (n = 120 [40 steers per pen]). The model included treatment, with an error term of pen nested within treatment, and a covariate of final steer weight.

Results and Discussion

Performance Parameters. There were no differences between housing treatments ($P > 0.05$) for ADG, ADFI or F:G (Table 1).

Carcass Characteristics. Dressing percentage ($P = 0.02$) and HCW ($P = 0.01$) were greater for HP steers vs. FD steers between housing treatments. All other carcass characteristics did not differ ($P > 0.05$) between housing treatments (Table 1). Therefore, housing steers in a hoop resulted in comparable performance and meat characteristics to those beef steers housed in a conventional feedlot.

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Table 1. Performance and carcass characteristics of beef steers fed in a hoop barn or conventional feedlot (January to April 2007)[1].

	Treatment		
	Hoop (HP)	**Feedlot (FD)**	***P*-values**
Performance			
ADG (kg)	1.56 ± 0.02	1.62 ± 0.02	0.15
ADFI (kg)	25.6 ± 0.13	25.4 ± 0.13	0.28
F:G	7.15 ± 0.14	7.07 ± 0.14	0.80
Carcass Characteristics			
Dressing %	0.62 ± 0.002	0.61 ± 0.002	0.02
HCW (kg)	364.1 ± 3.52	357.8 ± 3.52	0.01
Fat depth (cm)	1.03 ± 0.04	1.02 ± 0.04	0.88
KPH (%)	2.13 ± 0.04	2.18 ± 0.04	0.55
REA (cm^2)	83.6 ± 0.64	82.7 ± 0.64	0.34
Marbling Score[2]	1035± 5.73	1026 ± 5.81	0.42
Quality grade[3]	5.80 ± 0.22	5.47± 0.22	0.32
Yield grade[4]	2.14 ± 0.06	2.22 ± 0.06	0.41

[1]LSMeans and standard errors.
[2]Marbling score: Abundant = 1500-1590; Moderately Abundant= 1400-1490; Slightly Abundant = 1300-1390; Moderate = 1200-1290; Modest = 1100-1190; Small = 1000-1090; Slight = 900-990; Traces = 800-890; Practically Devoid = 700-790.
[3]Quality grade: Choice- = 1; Choice = 2; Choice+ = 3; Select- = 4; Select = 5; Select+ = 6; Standard- = 7; Standard = 8; Standard+ = 9.
[4]USDA yield grade = YG1 = 1; YG2 = 2; YG3 = 3; YG4 = 4; YG5 = 5.