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Fall Versus Spring Calving: Considerations and Profitability Comparison

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Cow-calf producers have several alternatives when it comes to selecting a breeding and subsequent calving season. The most common alternatives for calving seasons include spring, fall, winter and year-round calving. Producer definitions of calving seasons can vary, but a general timeline for the associated breeding and calving seasons, along with weaning months, are presented in Table 1.

Table 1. Traditional Breeding, Calving and Weaning Months in the United States Beef Cattle Industry

Calving Season[a]	Breeding Months	Calving Months	Weaning Months
Spring	May - Jun	Feb - Mar	Sep - Oct
Fall	Dec - Jan	Sep - Oct	Apr - May
Winter	Mar - Apr	Dec - Jan	Aug - Oct
Year-round	All months	All months	All months

[a]Assumes a 60-day breeding season

Most cow-calf producers using a defined calving season in the United States follow a spring calving season, while fall calving is the second-most common calving season. Spring calving is often utilized because of cool-season forage availability immediately following calving. A spring calving system also allows producers to wean and market calves prior to winter, which means the producers do not incur winter feeding costs for the calves. This would imply that producers are attempting to balance production costs along with revenues to maximize returns to the cattle operation. Alternatively, the fall calving season is utilized because the calving season generally occurs during the warm, dry months of the year, and calf prices are usually at their seasonal high at time of weaning.

Another popular alternative is year-round calving. Year-round calving presents several management challenges including increased feed costs and performing animal health practices. It is well documented that a controlled calving season is more profitable for beef cattle producers than year-round calving, but the relative profitability of spring and fall calving systems is less certain. Thus, the objective of this publication is to determine the most profitable calving season (spring or fall) in Tennessee.

Assuming profit maximization is an objective, several factors impacting costs and revenues of calving seasons should be considered. These factors include:

- Nutritional demands;
- Forage availability;
- Calf weaning weight;
- Calving rate (calves weaned per cow exposed to a bull);
- Seasonality of cattle prices;
- Seasonality of feed prices; and
- Labor availability.

Nutritional Demands and Forage Availability

Nutritional demands for the cow herd differ by calving season, as do forage availability and quality. It is important to consider seasonal nutritional demands for lactation, maintaining body condition and rebreeding. The nutritional needs for spring-calving cows closely match warm-season grass production. Similarly, fall-calving cow nutrition is closely aligned with cool-season grasses.

In Tennessee, tall fescue is the primary forage used by cattle producers. However, fescue forage production declines during the summer months. Additionally, cattle grazing endophyte-infected tall fescue during the summer are likely impacted by fescue toxicosis, which can negatively impact pregnancy rates, weight gains and net returns of spring-calving cows.

Calf Weaning Weight and Calving Rate

Several studies have evaluated the effects of calving season on animal performance (Table 2). The Arkansas and Tennessee studies focused on calving seasons of animals grazing tall fescue. Studies in Arkansas, Louisiana and Texas found fall-born calves had higher weaning weights than spring-born calves. Conversely, a Tennessee study found spring-born calves had higher weaning weights than fall-born calves. The Arkansas and Louisiana studies found higher calving rates and lower calf death loss in fall-calving herds, while a study in Oklahoma found higher calving rates in the spring. It is presumed fescue toxicity could have contributed to the lower spring calving rate in the Arkansas studies.

Table 2. Summary of Studies Evaluating the Animal Performance and Profitability Variables for a Spring and Fall Calving Season

Study	State	Pasture Info.	Lower Birth Weight	Higher Calving Rate	Lower Calf Death Loss	Lower Culling Rate	Higher 205-day Weaning Weight
Bagley et al. (1987)	LA	Bermudagrass, Ryegrass, White Clover	Fall	Fall	Fall	Fall	Fall
McCarter, Buchanan, & Frahm (1991)	OK	Bermudagrass, Bluestem, Buffalograss	NA	Spring	NA	Spring	ND
Gaertner et al. (1992)	TX	Bermudagrass, Ryegrass, Clover	Fall	NA	NA	NA	Fall
Campbell et al. (2013)	TN	E+ Fescue[a]	ND	NA	NA	NA	Spring
Caldwell et al. (2013) & Smith et al. (2012)	AR	E+ Fescue & E- Fescue[a]	NA	Fall	Fall	Fall	Fall

NA - Not applicable; ND - No significant difference.
[a]E+ Fescue includes fescue varieties infected with an endophyte, producing toxins called ergot-alkaloids. E- Fescue includes fescue varieties without the endophyte.

Weaning weights may differ by calving season due to climatic conditions and/or nutrient availability. Fall-calving cows have a higher nutrient demand than spring-calving cows during the winter months when forage supply is low. The increased demand for nutrients during the winter months generally results in higher feed costs for the fall-calving herd.

Seasonality of Cattle and Feed Prices

Another consideration for cattle producers is associated with changes in beef cattle and feed prices throughout the year. The seasonality of cattle and feed prices greatly influences profits. Fall-born calves marketed in the spring often receive higher prices than identical weight, spring-born calves marketed in the fall. The price difference is largely due to supply and demand for calves. Supply is driven by most calves being weaned and marketed in the fall and fewer calves being weaned and marketed in the spring. Similarly, demand is largely driven by grass availability. Demand for calves tends to be stronger in the spring when grass begins to grow and lower in the fall when many forage species are entering dormancy. Additionally, yearly feed costs are often higher for fall-calving cows than for spring-calving cows, due to a need for greater nutritional intake while rebreeding and nursing a calf in winter.

Labor Availability

Labor availability is also an important factor for producers to consider when selecting a calving season. Beef cattle producers that also grow crops might have few labor hours to devote to a fall calving season. Producers harvesting crops in the fall likely have more labor hours available for a spring calving season, which generally occurs prior to crop planting. It is also important for producers with off-farm jobs to consider labor availability during calving seasons as it relates to labor needs of the off-farm job.

Purpose of the Publication

The objective of this publication is to determine the most profitable calving season—spring or fall—based on 19 years of cow-calf production data collected in Tennessee. Cow-calf producers have many reasons other than profitability, such as convenience or labor availability, for choosing one calving season over another. Convenience factors and labor availability are not easily discussed over a broad audience nor measured, but profitability of calving seasons can be discussed and measured.

In order to determine the most profitable calving season, it is important to consider differences in calving rate, calf death loss, cow cull rate, calf weight at marketing, cattle prices at marketing, feed costs, and other factors associated with spring and fall calving. For example, revenue for a commercial cow-calf producer is earned from selling calves (i.e., bulls, steers and heifers) and culled cows. Cattle prices have seasonal variation and tendencies that impact revenue. Alternatively, expenses accrue from feed, land, labor, veterinary health and marketing. Feed costs vary across calving seasons due to changing feed prices and cattle nutrient needs based on the stage of gestation of the cow. Feed prices, similar to cattle prices, have a seasonal pattern based on supply and demand factors. Furthermore, calf weaning weight, calf death loss, and cow cull rate affect revenue and costs and may vary by calving season.

Data

Animal Production

Data originating from the AgResearch and Education Center at Ames Plantation, near Grand Junction, TN, from 1990 to 2008 were used to compare spring- and fall-calving cattle herds. The spring- and fall-calving cows consisted of commercial and purebred Angus cattle. Commercial cattle were

predominantly Angus with Simmental and Hereford influence. The sires were purebred Angus. Cows were not switched between the spring- and fall-calving herds. The spring-calving herd calved from mid-February through mid-April. The fall-calving herd calved from mid-September through mid-November.

Both herds grazed endophyte-infected tall fescue and were supplemented with free choice mineral and corn silage year round, as needed. The quantity of corn silage and mineral fed to cattle in each herd was not recorded. Cows were culled due to failure to rebreed, poor calf performance and age. Over the 19-year period, the spring herd totaled 478 cows with 1,534 calves born, and the fall herd totaled 474 cows with 1,727 calves born. These cow and calf totals reflect the number of cows and calves in the herd at some point over the 19-year period.

Records were not kept for cows that did not calve; thus, percent calf rate could not be calculated directly. Table 3 includes the average birth weight and adjusted 205-day weaning weight by steer and heifer calves in the spring- and fall-calving herds. It should be noted that the average adjusted 205-day weaning weight for steers and heifers born in the spring were 43 and 25 pounds greater, respectively, than their counterparts born in the fall.

Table 3. Average Birth Weight (lb) and Adjusted 205-day Weaning Weight[a] (lb) by Calving Season and Calf Sex at Grand Junction, Tennessee, from 1990-2008

	Spring Calving Season		Fall Calving Season	
Weight	**Steer**	**Heifer**	**Steer**	**Heifer**
Average Birth Weight (lb)[b]	79.94 (13.54)	73.34 (12.65)	77.72 (15.26)	70.38 (14.23)
Average Weaning Weight (lb)[c]	623.83 (103.13)	562.95 (88.28)	581.24 (93.23)	537.93 (82.12)

Standard deviations are noted in the parentheses.

[a]Adjusted 205-day weaning weight is a method of standardizing weaning weights to a calf age of 205 days so comparisons can be made.

[b]Birth weights were significantly different for spring- and fall-born heifers at the 5 percent level.

[c]Weaning weights were significantly different for spring- and fall-born steers and heifers at the 5 percent level.

Cattle Budgets and Prices

The culled-cow percentage of 16 percent, cow death loss of 1 percent, calving rate of 90 percent, and culled-cow weight of 1,100 lbs were assumed for both the spring and fall calving seasons. Death loss for calves was assumed to be 5 percent for the spring-born calves and 3 percent for the fall-born calves. Based on data collection methods, it was not possible to differentiate between cow culling because of failure to conceive or calf mortality. Thus, it was assumed the lower weaning rate in the spring-calving herd relative to the fall-calving herd was strictly due to death loss. This assumption is based on four fewer cows going through the fall-calving herd, yet the fall-calving herd producing 193 more calves in the 19-year period.

Monthly Tennessee beef price data for steers, heifers and culled cows were collected from 1990 to 2013 (Table 4). The average price of steers marketed in April ($134.46/cwt) and May ($132.83/cwt) exceeded the average price of steers marketed in September ($125.26/cwt) and October ($122.72/cwt) by $7 to $12/cwt (Table 4). A similar comparison can be made for heifer-calf and cull-cow prices in the spring versus the fall marketing months where the average April and May price exceeded the average September and October price.

Table 4. Average Monthly Price ($/cwt) for 500-600 lb Steers, 500-600 lb Heifers and 1,100-1,600 lb Culled Cows in Tennessee from 1990 to 2013 in 2013 Dollars

Month	Average Steer Price ($/cwt)	Average Heifer Price ($/cwt)	Average Culled Cow Price ($/cwt)
		Spring Calving Season	
September	$125.26	$120.35	$58.37
	(21.34)	(22.28)	(15.81)
October	$122.72	$116.34	$59.70
	(21.39)	(21.94)	(15.31)
		Fall Calving Season	
April	$134.46	$129.49	$66.42
	(22.62)	(23.92)	(15.53)
May	$132.83	$128.43	$68.22
	(22.15)	(23.63)	(16.02)

Source: USDA-AMS (2012) and BLS-CPI (2013).
Standard deviations are noted in the parentheses.

Feed Prices and Ration Scenarios

Monthly prices for hay and other feedstuffs reported at Memphis, TN, and St. Louis, MO, (the nearby reporting locations to Tennessee) were collected from 2000-2013. Price availability was limited to 2000-2013 for December, January, February and March (Table 5).

Eight scenarios were evaluated using calving season, weaning month and winter feed ration (two calving seasons x two weaning months x two feed rations = eight scenarios). Spring-born calves were assumed to be weaned and sold in either September or October. Fall-born calves were presumed to be weaned and sold in either April or May. Two feed rations were developed for each calving season and weaning-month scenario to provide estimates of winter feed quantities.

Least-Cost Feed Ration

Two feed rations for each calving season and weaning-month scenario were developed to meet the nutrient requirements for cows in the spring- and fall-calving herds for December, January, February and March. It was assumed both spring- and fall-calving herds had adequate nutrition available through grazing tall fescue pastures during the remaining months of the year. Nutritional requirements differ by month and by calving season due to different gestation cycles, impacting the quantity of feed needed by month.

Rations were developed for each calving herd using the National Research Council (NRC) Nutrient Requirements of Beef Cattle. The NRC uses the size of the cow, time in gestation and milk production to determine the minimal nutrient intake needed per day. Energy and protein requirements increase approximately 60 days into lactation and during the last 60 days of gestation.

Eight commonly accessible ingredients in Tennessee, including hay, corn gluten feed, corn silage, dried distillers grains, soybean hulls, whole cottonseed, rice bran and wheat middlings, were evaluated for least-cost ration development (Table 5). The two least-cost rations were constructed to select across the eight ingredients: (1) when at least 20 lb/day of orchardgrass hay was fed; and (2) when orchardgrass hay was not required to be fed. The objective was to find the combination and quantity of the eight ingredients that minimized costs while providing a cow the minimum amount of dry matter intake (DMI), metabolizable protein (MP) and net energy for maintenance (NEm) per month.

Table 5. Average Monthly Prices ($/dry ton) for Feed Ration Ingredients from 2000 to 2013 in 2013 Dollars

Month	Orchardgrass Hay ($/ton)	Corn Gluten Feed ($/ton)	Corn Silage ($/ton)	Dried Distillers Grains ($/ton)	Soybean Hulls ($/ton)	Cottonseed Whole ($/ton)	Rice Bran ($/ton)	Wheat Midds ($/ton)
December	$121.38	$129.99	$40.12	$159.83	$142.01	$207.22	$125.85	$146.00
	(34.40)	(40.97)	(15.56)	(51.32)	(42.89)	(66.88)	(56.16)	(59.83)
January	$104.40	$122.45	$40.03	$156.47	$133.34	$197.74	$120.57	$134.68
	(43.76)	(29.37)	(16.50)	(41.69)	(34.59)	(59.09)	(47.23)	(51.80)
February	$111.94	$120.69	$41.32	$156.27	$128.65	$195.81	$115.23	$125.63
	(41.07)	(31.26)	(17.35)	(45.16)	(30.13)	(60.51)	(40.96)	(49.30)
March	$115.57	$116.72	$42.13	$156.71	$119.50	$199.72	$103.92	$132.72
	(48.44)	(33.98)	(17.75)	(48.41)	(30.64)	(63.86)	(39.81)	(53.52)

Source: USDA-AMS (2012) markets in St. Louis, MO, and Memphis, TN, as well as BLS-CPI (2013).
Standard Deviations are noted in the parentheses.

Results

Least-Cost Rations

Table 6 shows the quantity (lb/day) of each ingredient in the two least-cost feed rations, providing the minimum requirements of DMI, MP and NEm by month and calving season. Both of the rations include orchardgrass hay, corn gluten, corn silage, rice bran and wheat middlings. Spring-calving cows required less daily feed in December and January than fall-calving cows. The spring-calving cows were transitioning from a late-gestation and no-lactation period into a calving and lactation period in December and January, and the fall-calving cows were moving from a breeding and lactation period to an early gestation and lactation period, which required higher levels of MP and NEm. However, in February and March, spring-calving cows required higher feed intake because the spring-calving cows were reaching the peak lactation period. Overall, fall-calving cows required more feed from December through March than spring-calving cows, resulting in higher total feed cost. Removing the orchardgrass hay constraint reduced the total feed quantity required and lowered total feed cost, resulting in a shift to feeding more corn silage and less orchardgrass hay.

Table 6. Amount of Ingredients Fed (dry lb/day) and Total Cost in Each of the Least-Cost Winter Feed Rations by Calving Season and Month

Ingredients (dry lb/day)	Spring Calving Season				Fall Calving Season			
	December	January	February	March	December	January	February	March
Minimum of 20 lb/day of Orchardgrass Hay Fed								
Orchardgrass Hay	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Corn Gluten Feed				10.48				
Corn Silage	9.75				14.63	5.93	8.71	
Rice Bran				0.90				9.50
Wheat Middlings		9.42	12.11			5.92	1.57	
Total Feed	29.75	29.42	32.11	31.38	34.63	31.86	30.28	29.50
Total Feed Cost	$60.33	$58.16	$65.13	$64.16	$69.65	$61.26	$59.10	$56.83
No Minimum of Orchardgrass Hay Fed								
Orchardgrass Hay						2.25	15.30	
Corn Gluten Feed				2.48				
Corn Silage	27.75	26.48	23.35		32.63	29.60	14.98	
Rice Bran				28.90				29.50
Wheat Middlings		2.90	8.00					
Total Feed	27.5	29.38	31.35	31.38	32.63	31.85	30.28	29.50
Total Feed Cost	$56.06	$57.34	$63.40	$57.33	$62.39	$60.55	$58.91	$53.01

Source: NRC (1996)

Net Returns

Beef cattle production data from Ames Plantation and price data collected from USDA-AMS were used in conjunction with the University of Tennessee cow-calf budget to calculate net returns. Average net returns (in $/head) are presented in Table 7. For the spring calving season, expected net returns were higher when there was no minimum quantity of orchardgrass hay fed. Weaning in September was more profitable than weaning in October for spring calving. A spring-calving cow that was fed a ration without the orchardgrass hay constraint and weaned in September had the highest expected net returns ($10.03/head), but this scenario also had the highest variability in net returns for the spring calving scenarios.

Table 7. Summary Statistics of Simulated Net Returns by Calving Season, Least-Cost Winter Feed Ration and Weaning Month

Ration	Weaning Month	Expected Net Returns ($/head)	Standard Deviation Net Returns ($/head)	Probability Net Returns>0[a]
			Spring Calving Season	
Minimum Hay Constraint[a]	September	-19.95	83.81	39%
	October	-30.89	86.07	34%
No Minimum Hay Constraint	September	10.03	93.72	54%
	October	-1.01	92.37	49%
			Fall Calving Season	
Minimum Hay Constraint[b]	April	14.76	87.75	54%
	May	12.16	86.03	53%
No Minimum Hay Constraint	April	37.92	90.99	66%
	May	35.52	90.55	65%

[a]Provides the probability of net returns being positive in a given year.
[b]Minimum of 20 lbs/day of orchardgrass hay.

Similarly, feeding a fall-calving cow a ration with no minimum quantity of orchardgrass hay had higher expected net returns and higher variability of net returns than feeding a ration with a minimum quantity of orchardgrass hay. Marketing fall-born calves in April produced higher expected net returns and higher variability in net returns than marketing in May. A fall-calving cow that was not fed a minimum amount of orchardgrass hay and weaned in April had the highest expected net returns ($37.92/head) but also had the most variability in net returns. A fall-calving cow that was fed a minimum amount of orchardgrass hay and weaned in May had the lowest variability of net returns but also had the lowest expected net returns for the fall calving scenarios.

A profit-maximizing beef cattle producer would select fall calving over spring calving regardless of the feed ration and weaning month given the scenarios considered (Table 7). Two studies in Arkansas also found fall calving had higher net returns than spring calving. The spring-calving cows had heavier calves at weaning (Table 3) and lower feed costs than the fall-calving cows (Table 6); however, cattle prices at weaning were higher for calves born in the fall (Table 4). The higher prices of steer and heifer calves captured by fall-born calves were able to cover the higher feed expenses and lighter weaning weights by the fall-born calves. This suggests that seasonality of feed and beef prices were the primary factors impacting the results.

Conclusions

Selecting an optimal calving season is a complex and important decision for cow-calf producers, requiring consideration of animal performance and seasonality of prices. However, information is limited on the profitability and risk associated with spring and fall calving seasons in the southeastern United States. The objective of this research was to evaluate the profitability and risk for spring and fall calving seasons for beef cattle in Tennessee while considering the seasonality of cattle prices and feed prices for least-cost feed rations.

For spring calving, weaning and marketing in September was more profitable than weaning and marketing in October. Weaning fall-born calves in April resulted in higher expected net returns and higher variability in net returns than weaning in May. The fall calving season was found to be more profitable than the spring calving season regardless of the feed ration and weaning month. Despite spring-calving cows having heavier calves at weaning and lower feed costs than the fall-calving cows, the higher prices of steer and heifer calves captured by fall-born calves were able to cover the higher feed expenses and lighter weaning weights by the fall-born calves.

The majority of beef cattle producers in Tennessee who operate with a defined calving season choose to follow a spring calving season. However, the fall calving season is more profitable than the spring calving season. Further research is needed on the economics of switching a spring-calving herd to a fall-calving herd. The cost of switching calving seasons might be greater than the increased revenue streams over time.

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