story in brief

The Arkansas Beef Improvement Program (ABIP) uses an integrated resource management approach to gain and transfer knowledge about beef cattle and forage management. Special projects included establishing breeding and calving seasons, replacement heifer development, hay quality, forage testing and supplemental feeding, stockpiled forages, pasture renovation, cow herd performance, and market cow management. Production and financial data were measured to evaluate the progress of each project. The average number of years it took to reduce breeding and calving seasons to 90 d was 4.3 ± 0.58 yr. In the replacement heifer special project, heifers reached over 100% of their expected breeding weight at a cost of gain of $0.32/lb. During the hay quality special project, hay yields improved by an average of 52 ± 8.0%, and production costs decreased by an average of 33 ± 12.6%. The average production cost per large round bale of hay was $17.13 ± 0.24. When comparing the cost of stockpiling forage to the cost of hay and supplement to achieve the same level of cattle performance, stockpiling saved an average of $17.92 ± 14.17/head and $11.29 ± 21.79/head for fescue and bermudagrass, respectively. The net return of wintering market cows from the fall to the spring was $48/head. The ABIP special projects were excellent educational methods to demonstrate cost effective beef cattle and forage management practices.

introduction

Extension demonstrations are very effective educational methods, but can be time consuming. Because of the success of the Arkansas Beef Improvement Program (ABIP) whole farm program, which required a 5-yr commitment, special projects were developed that looked at specific beef cattle and forage management practices. Three advantages for implementing ABIP special projects were: 1) more counties could get involved in the ABIP program; 2) special projects would last 2 to 3 yr; and 3) specific beef cattle and forage management practices could be better evaluated. The objective of this paper is to document the ABIP special project educational processes and share knowledge gained with the Arkansas cattle industry.

experimental procedures

breeding and calving seasons special project. The objective was to demonstrate the beef cattle management changes necessary to convert a year-long breeding and calving season to a short breeding and calving season (< 90 d) and to assess the impact of those changes. From the benchmark calving distribution, a plan of work was developed to reach the cooperators’ desired breeding and calving season. Supplemental feeding, mineral supplementation, breeding soundness examinations for bulls, and other management factors that could affect reproduction rates were reviewed and, if necessary, changes were made.

replacement heifer development special project. The objective of the replacement heifer development special project was to demonstrate the management necessary to develop heifers from weaning to first breeding. Heifers were individually identified and weighed at weaning to establish a beginning BW. Data such as hip height measurements and muscle scores also were recorded. Projected target BW (65% of mature BW) and date for breeding were determined, and harvested forages were tested. A least-cost supplement was calculated to obtain the appropriate gain necessary to reach the target BW at the projected breeding date. Two blood samples were collected 10 d apart to assess progesterone levels and to determine estrous cycle activities prior to the breeding season. Heifers were individually weighed every 30 to 45 d and at the beginning of the breeding season.

hay quality special project. The objective was to demonstrate proper fertilization and harvesting practices to improve hay quality. Soil analyses and pasture inventories were conducted annually on each hay meadow. Data such as harvest information (harvest conditions, tonnage, etc.), rainfall, inputs (including fertilizers, agricultural lime, chemicals, etc.), and hay analysis from each harvest date were collected.

forage testing and supplemental feeding special project. The objective was to develop supplements based on forage analysis for wintering beef cattle. A representative sample of each cutting of harvested forage was analyzed to determine nutritional value. A supplement was formulated based on the results of the forage test, nutritional requirements of beef cows (NRC, 1996), and locally available feedstuffs. Data collected included supplementation cost, cost of historical supplementation practice, and cattle performance (BW, body condition scores, etc.).

stockpiled forages special project. The objective was to demonstrate the practice of stockpiling forage in the fall for winter grazing. Stockpiling pastures had at least 50% cover of fescue or bermudagrass. Nitrogen fertilizer was applied (50 to 60 lb/acre) in late summer or early fall, and forage growth was allowed to accumulate. Forage samples were collected to determine nutrient value and nitrate-N concentration in October, d 1 of cattle grazing, and once monthly until forage availability became limiting. Yield was estimated on d 1 of cattle grazing by clipping a 0.2 m² area of forage to 4.0 cm. Samples were dried and weighed. Data collected included number of cattle grazing, cattle performance (BW, body condition scores, etc.), pasture size, number of days grazed, cost associated with stockpiling, and cost associated with hay and supplement (if necessary) to obtain similar cattle performance as achieved from stockpiling forage.

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2 University of Arkansas Cooperative Extension Service, Little Rock
Pasture Renovation Special Project. The objective was to demonstrate effective pasture improvement by matching recommendations with the producer's goals. Producer goals were to increase stocking rates, utilize rotational grazing, have forage available year-round, reduce hay feeding to 60 d, and eliminate the need for a designated hay meadow so all pastures could be harvested (grazing or hay). Pasture fields were soil tested each year, and inventories were completed in the spring and summer for forage species, weeds, and bare ground percentage. Recommendations for fertilization, weed control, and grazing and hay management were based on results of these assessments. To improve forage growth and to establish legumes, target fertility levels were set at a soil pH of 6.0, phosphorus of 60 lb/acre and potassium of 200 lb/acre. Fertilizer application was timed to stimulate growth of remnant patches of warm-season grasses for summer grazing in some pastures and to encourage establishment and growth of legumes in others. Rotational grazing was used to improve legume persistence and to extend available forage during summer months. Annual lrespedeza and clover were overseeded in selected pastures during winter to improve forage quality.

Cow Herd Performance Special Project. The objective was to demonstrate the improvement of economically important traits in a beef cattle herd through selection of high performing females for herd replacements and the removal of low performing females. Cooperators were required to individually identify cows and calves, maintain a breeding season (< 90 d), record calving dates, participate in the Arkansas Steer Feedout Program, and weigh cows and calves to determine 205-d adjusted weights, weight ratios, and Most Probable Producing Ability (BIF, 2002). Cow efficiency was defined as the 205-d adjusted BW divided by the dam's BW at the time of weaning. The Arkansas Steer Feedout Program provided the opportunity to acquire postweaning performance (feedlot ADG, etc.) and carcass characteristics (USDA Quality Grades, yield grades, etc.) data. With input from the cooperator, low-performing cows were marketed, and heifers were selected for replacements.

Market Cow Management Special Project. The objective of the market cow management special project was to demonstrate the management necessary to improve the value of market (cull) cows. Cows were selected for culling and were individually identified and weighed in the fall at weaning time. When the cows were selected for culling, the value of the market cows was determined by a USDA certified livestock reporter. Body condition scores (BCS; 1 to 9 scoring system) were recorded, and a feeding program determined to improve condition. At the time of marketing, cull cows were individually weighed and BCS recorded.

Analysis. Income and specified expenses were recorded and analyzed as described by Gadberry and Troxel (1999). Where statistical analysis was not appropriate, means ± SD were used to describe the data. The t-test as described by Freund and Wilson (1993) was used to determine if the percent change in production items was different from a zero percent change within special projects. An analysis of variance was performed with the GLM procedure of SAS (SAS Inst., Inc., Cary, N.C.) to analyze production level differences in special projects.

Results and Discussion

Breeding and Calving Season Special Project. Five farms were enrolled in this special project with an average of 53 ± 46.6 cows. The average number of years it took to reach the cooperator's desired breeding and calving season goals was 4.3 ± 0.58 yr. The percentage of cows calving during the desired calving season in the baseline year (yr = 0) was 36.5 ± 12.2%. The percentage of cows calving in the desired calving season increased from the baseline year to 40.5 ± 7.2%, 46.7 ± 16.6%, 67.0 ± 31.6%, 87.0 ± 22.5% and 100 ± 0.0% for yr 1, 2, 3, 4 and 5, respectively. The average length of the calving season decreased to 281.5 ± 57.0, 230.8 ± 69.4, 217.0 ± 109.0, 133.75 ± 72.2, 100.0 ± 45.8 and 96.7 ± 4.7 d for yr 1, 2, 3, 4 and 5, respectively. When averaged across all farms, break-even (specified cost divided by pounds of beef sold) decreased 38% from $0.50 ± 0.08/lb to $0.31 ± 0.07/lb in yr 3. Specified cost/AU dropped from $180.19 ± 62.24 to $121.89 ± 7.10 from yr 0 to yr 3, respectively. Income over specified cost improved 75% from $77.65 ± 63.73/AU in yr 0 to $135.53 ± 44.58 in yr 3. This demonstrated that the farms were able to increase beef production efficiency due to decreasing the breeding and calving season. This project was very successful, but required a cattle cooperator who was committed to reducing the breeding and calving season and would stay with the program for 4 to 5 years.

Replacement Heifer Development Special Project. Six cooperators participated in the 2-yr project with an average of 18.0 ± 9.3 heifers. It was discovered that most cooperators were overfeeding because they thought high rates of gain were necessary. In yr 1, the average heifer reached 103.3 ± 11.2% of their target BW, and in yr 2 the average heifer reached 102.5 ± 7.3% of their target BW. The number of heifers exhibiting estrous cycles prior to the breeding season improved from 60.0 ± 13.9% in yr 1 to 82.2 ± 8.3% in yr 2. The feed cost/lb of gain for yr 1 and 2 were $0.48 ± 0.33/lb and $0.32 ± 0.08/lb, respectively. The total cost/lb of BW gain for yr 1 and 2 were $0.69 ± 0.20/lb and $0.50 ± 0.20/lb, respectively. The total cost of raising heifers to breeding (including the value of the heifer) ranged from $732 to $782/head.

Hay Quality Special Project. The four farms enrolled in the hay quality improvement project were already producing good-quality hay. Therefore, it was difficult to make great quality improvements. When averaged across the farms completing the project, crude protein (CP) and total digestible nutrient (TDN) content of hay did not change; however, one farm improved CP percentage by 20% and TDN by 7%. Forage maturity at harvest has the greatest influence on hay quality. Seasonal weather variations such as delayed harvest during wet spring weather and extended harvest intervals during summer drought influenced hay maturity and quality. Producers did benefit from recommendations through increased hay yields and lesser production costs. Across farms, hay yields improved by an average of 52 ± 8.0%, and production costs decreased by an average of 33 ± 12.6%. The average production cost per large round bale (4 X 5 foot) of hay was $17.13 ± 0.24. This information has helped producers to determine the value of hay being sold or produced.

Forage Testing and Supplemental Feeding Special Project. Eleven cow-calf cooperators with an average of 41 ± 35.3 cows and three stocker cattle cooperators with an average of 134 ± 107.1 stockers participated in this special project. When working with the cow-calf cooperators, three situations were experienced. The first situation was the hay quality was sufficient so no additional protein or energy supplementation were needed. One cooperator discovered that hay quality was 12.9% CP (DM basis) and 63.2% TDN (DM basis) which was sufficient to meet the protein and TDN requirements (NRC, 1996) of his cows. A second producer saved $14.24/head because the hay met CP and TDN requirements. The range meal he usually fed was not necessary. In some cases, the supplemental feed cost did not change. For example, a cooperator was spending $1.45/head/d (cost includes hay and supplement) on supplemental feed but was purchasing the wrong kind of feed (soybean hulls and a liquid feed supplement). As a result of the forage analysis, the liquid feed was discontinued and additional soybean hulls were fed, resulting in a feed cost of $1.46/head/d. A third situation
occurred where the hay quality was low and supplemental feed cost increased. Because of the additional supplement, average cow BCS improved from 4.5 to 5.0, and the cooperator was pleased with overall cow performance. In conclusion, supplemental rations when hay quality was average or better resulted in a reduction of $3.50 to $12.00/head in winter feed costs. In contrast, when hay quality was poor, cattle were reported (by the producers) to improve in condition when steps were made to implement feeding recommendations designed to maintain or improve body condition. On average, winter feed costs were $0.61 ± 0.07 head/d when hay quality met animal requirements and $1.32 ± 0.20 head/d when hay quality did not meet animal requirements.

Two extremes were experienced with the stocker cattle cooperators. One stocker cattle operator had high-quality hay (18.5% CP and 66.4% TDN; DM basis). A corn and soybean hull pellet mixture was recommended resulting in BW gains of 1.0 to 1.25 lb/d at a cost of $0.43/lb. A second stocker cooperater had lesser quality hay (11.9% CP and 51.8% TDN) but was expecting calves to gain 1.0 to 1.25 lb. It was recommended that 4 lb of corn be supplemented, which he chose not to feed.

Stockpiled Forages Special Project. Ten cooperators (8 stockpiled fescue and 2 stockpiled bermudagrass) with an average of 35 ± 19.9 cows participated in this special project. The average cost of stockpiled fescue and bermudagrass was $13.90/acre and $21.00/acre, respectively. The average production per acre of stockpiled growth for fescue and bermudagrass was 2,031 ± 554.6 lb/acre and 2,531 ± 997.2 lb/acre, respectively. The number of days cattle grazed the stockpiled fescue and bermudagrass was 50 ± 27.3 d and 117 ± 52.3 d, respectively. When comparing the cost of stockpiling to the cost of hay and supplement to achieve the same level of cattle performance, stockpiling saved an average of $17.92 ± 14.17/head and $11.29 ± 21.79/head for fescue and bermudagrass, respectively.

Quality of stockpiled fescue was consistently high across farms and years (Figure 1). Mean concentration of CP and TDN declined during the winter, but generally met or exceeded the requirements for a lactating 1,100 lb cow until late winter. Average CP and TDN of hay sampled on each farm was 12.4 ± 2.2% and 55.3 ± 4.8%, respectively, which was less than that of most stockpiled fescue samples.

Pasture Renovation Special Project. After yr 3, percentage of the pasture covered by legumes increased by 6% and warm-season grasses increased to 45% across the farm. Bare ground percentage decreased from 21% to less than 5% across the farm. The number of grazing days increased by 51%, and the number of winter hay feeding days decreased by 43%. The designated hay meadow was eliminated, and all fields were grazed or harvested for hay as needed due to increased forage productivity. The cost of pasture improvement including inputs for fertilizer, lime, herbicide and seed averaged $28.15 acre/yr. Results indicated that pastures could be effectively improved without total renovation by accurately assessing pasture conditions, then matching recommendations with those assessments and producer goals.

Cow Herd Performance Special Project. Three farms with an average of 47 ± 19.6 calf records per year participated in the cow herd performance special project. All farms showed an increase in 205-d adjusted BW from yr 1 to the final year. The increase in 205-d adjusted BW from yr 1 to the final year for farms 1, 2, and 3 were 44 lb, 79 lb and 27 lb, respectively. In addition, BCS generally increased, specified cost/AU decreased 79% and specified cost divided by lb of beef sold dropped 41% from yr 1 to yr 5. This project showed dramatic results, especially when the average 205-d adjusted BW of the cooperator’s herd was low. It did, however, take at least 4 to 5 yr to change cow herd genetics to the point where herd averages were impacted.

Market Cow Management Special Project. Only one farm with six market cows participated in this project. The average BW, live value/cwt., and value per head on December 4, 2002 were 1,070 ± 98.7 lb, $29.33 ± 2.25, and $315.56 ± 53.61, respectively. The average BW for market cows on sale date (March 1, 2003) was 1,107 ± 8.26 lb. All market cows sold for $35.00/cwt or an average $388/head. The cost of wintering the market cows was $26/head (hay, supplemental feed, mineral and salt). This resulted in a return of $48/head. Retaining ownership of market cows from the fall to the spring has been a profitable practice 20 out of the last 21 years (Cattle-Fax, 2001); the average net return/head was $36.32, $46.80 and $54.07, for the five-yr, 10-yr, and overall averages, respectively. The return experienced in this special project was similar to the norms reported by Cattle-Fax (2001).

Implications

The Arkansas Beef Improvement Program special projects have demonstrated cost-effective beef cattle and forage management practices. Most of the practices demonstrated can be implemented by the Arkansas beef cattle industry regardless of farm size. This educational approach provided learning opportunities not only for the producer but also the participating Extension personnel.

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Literature Cited


Fig. 1. Crude protein (CP) and total digestible nutrient (TDN) percentage of stockpiled fescue samples collected from ABIP project farms.