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Case Study: Extension Demonstrations Examine On-Farm Wheat Yield Responses to Grazing and Survey Thoughts on Establishment and Enterprise Diversification

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ABSTRACT

On-farm case studies were established in Arkansas to examine the effects of grazing on wheat (Triticum aestivum L.) grain yield and to survey producers and educators about their thoughts on wheat establishment methods and enterprise diversification. Eight demonstration sites from 2005 to 2008 established wheat for grazing. Grazing pressure ranged from 0.9 to 7.7 animal units (au; 1 au = 454.54 kg BW) per hectare. Grazing restriction cages were assembled in the fall before grazing and in the spring near first hollow stem to examine the effects of grazing on wheat. Either wheat was harvested or plant seed head counts were substituted in the case of plant sterility or heavy bird predation. Overall, grazing reduced average plant counts by 24% among 4 demonstration sites that could not be harvested. Two of the 4 sites observed ($P < 0.05$) reductions in plant counts. Four sites were harvested for grain. Wheat grain yield averaged 2,708 kg/ha and was not affected ($P > 0.10$) by grazing. Ninety-one percent of producers attending wheat grazing field days were implementing establishment methods other than clean tillage. Producers and educators indicated that enterprise diversification will be important to long-term sustainability of agriculture in the United States; however, educators responded with a unanimous certainty, whereas the producers responded with less certainty (greater variation). In addition, producers indicated ($P < 0.05$) they were more likely to adopt alternative tillage systems and diversified production systems because of economic enhancement, whereas educators were more likely to recommend these systems for environmental enhancement.

Key words: wheat, grazing, survey, demonstration

INTRODUCTION

Arkansas annually produced an average 827,000 calves from 1998 to 2008 (National Agricultural Statistics Service, 2009a). Because there is no major beef-packing industry in Arkansas, the majority of these calves leave the state for finishing. Wheat (*Triticum aestivum* L.) grazing is an historical practice among states along the western border of Arkansas (Zhang et al., 2008), and many cattle weaned and marketed in Arkansas in the fall are managed as stocker cattle on wheat before feedlot entry.

Arkansas planted an average 335,000 ha of wheat annually from 1998 to 2008 (National Agricultural Statistics Service, 2009b). However, there is a geographical bifurcation among crop-producing and livestock-

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producing areas within the state. Wheat is a crop that is capable of adding value to calves after weaning and before feedlot entry, and contract grazing is a possible mechanism for adding value to a wheat crop (Redmon et al., 1995). Therefore, Arkansas cattle producers, through retained ownership, and wheat producers, through contract grazing, should explore the opportunity to capture this additional value within the state.

Little information is known about the impact of grazing soft winter wheat varieties planted in Arkansas soil types. Daniels et al. (2002) reported that nongrazed soft red winter wheat planted in a silt loam soil at the Livestock and Forestry Branch Station near Batesville, Arkansas, yielded 1,644 kg/ha compared with 2,972 kg/ha for grazed wheat. In addition, wheat is often planted in a prepared seedbed, and producers question the ability to graze cattle given the abundant fall and winter moisture in Arkansas. As a result, this case study set out to accomplish 2 objectives: 1) to examine the impact of grazing wheat under different soil types and establishment conditions by using producer demonstration farms, and 2) to survey the thoughts of producers and educators on wheat establishment practices and enterprise diversification.

MATERIALS AND METHODS

Case Study Farm Activities

Case study farm requests were made to county extension agricultural agents in July of each year. A county that expressed interest in conducting a case study was contacted, and a farm planning visit was scheduled in August. The goal was to establish 3 case studies per year. Observations made on each farm included hectarage planted to wheat for grazing, planting method, planting dates, soil type and fertility, fertilization practices, weed control, and animal type (calves or cows) and number of cattle grazing. Plot conditions were monitored twice per month by county extension agents. Beginning in February, county extension agents monitored the plots on a weekly basis. Replicated grazing restriction cages were assembled on each farm in the fall before grazing to reflect nongrazed wheat yield, and in the spring to simulate grazing restriction near first hollow stem (Redmon et al., 1996; Fieser et al., 2006).

Animal BW or change in BW was optional because of on-farm limitations of working and weighing facilities. However, the Perry county agent weighed calves at the beginning and end of grazing in the 2006 Perry county project. Because this project involved observing the influence of grazing on grain yield on producer-operator farms, there was no animal care committee review of the project. By observation, it appeared the farms were using industry-accepted beef cattle management practices regarding animal health, performance, and improving value, such as dehorning and castrating.

Soil type data and all references to soil type reported herein were accessed through the USDA, Natural Resources Conservation Service, Web Soil Survey Portal (Natural Resources Conservation Service, 2009). Soil samples were analyzed by the University of Arkansas, Soil Testing and Research Laboratory (Marianna) for pH (Donahue, 1983) and for P, S, and K by inductively coupled plasma spectroscopy (Spectro Analytical Instruments, Kleve, Germany), using the 3-soil extraction method (1:10 dilution ratio) of Mehlich (1984). Soil test results are presented in Table 1.

Pulaski County, 2005. In mid-September, wheat seed was broadcast-spread over soybeans [*Glycine max* (L.) Merr.] by aerial application (34°47′ N, 92°05′ W) into Rilla silt loam soil. The wheat stand was very poor and required replanting. After no-till drilling (John Deere 750 drill, Deere and Co., Moline, IL) in mid-October, grazing restriction cages measuring 11.5 m^2 were assembled in triplicate. In late February, 11.5-m^2 restriction cages were assembled adjacent to the fall restriction cages to simulate spring removal. In mid-February, plot areas were sprayed with mesosulfuron (Osprey, Bayer CropScience, Research Triangle Park, NC) to suppress annual ryegrass. In the spring, 134 kg/ha of N was split-applied. Mature, calving beef cows continuously grazed the wheat from November through mid-April at a stocking rate of 1 (545 kg BW) beef cow/ha. Plots were combine harvested in June 2007, and yield was determined as described previously. Plot results by site are summarized in Table 2.

Lafayette County, 2006. On October 17, 2006, wheat seed (Terral

Table 1. Soil nutrient profile at case study farm sites

Item	pH	P, ppm	K, ppm
Optimum[1]	>5.8	36 to 50	131 to 175
Lafayette County, 2008			
Broadcast	7.7	42	267
Drilled	6.9	93	222
Lafayette County, 2006			
Drilled	5.5	460	317
Pulaski County, 2006			
Broadcast	5.3	259	45
Drilled	5.1	171	48
Perry County, 2006			
Broadcast	5.0	46	96
Perry County, 2007			
Broadcast	5.6	40	61
Drilled	4.8	101	97

[1]Values below optimum resulted in a soil test recommendation.