The Professional Animal Scientist 29 (2013):372–382

A macromineral survey of Louisiana beef cow-calf production systems

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ABSTRACT

The survey purpose was to determine the state and regional macromineral status of Louisiana beef cow/calf production systems. Serum, forage, soil, and water were sampled from fall 2007 to spring 2009 at Louisiana beef-cattle operations (n = 25), which were divided into 7 regions (northwest, northeast, central, southwest, south central, Florida parishes, and southeast). Serum samples were collected twice annually in fall and spring, forage samples were collected quarterly, and soil and water were collected annually. The forage concentrations of Ca (0.42%); serum concentrations of Ca, Mg, Na, and S (9.0, 1.9, 303.3, and 103.3 mg/100 mL, respectively); soil concentrations of P, Na, and S (56.3, 88.4, and 29.7 mg/kg, respectively); and water concentrations of Na (84.7 mg/kg) were not different (P > 0.05) among regions. For all serum samples, less than 10% of Ca, 57% of Mg, and 14% of Na were less than reported lower critical levels in serum; 40% of Ca, 45% of P, small percentage of K, 70% of Na, and 7% of S were less than the minimum reported for appropriate nutrition in forage for beef cattle. All macromineral concentrations were above critical levels in soil as required for adequate plant growth. Water Na concentrations in regions northeast, southwest, south central, and Florida parishes were at desirable levels reported for livestock. Using serum as an indicator, the results indicated Louisiana cattle maintained adequate macromineral status and perhaps are partially reflective of the macromineral supplementation programs used throughout the state.

Key words: beef cattle, soil, macromineral status, forage, Louisiana

INTRODUCTION

Forage utilization is an essential factor in relation to beef-cattle nutrition for cow/calf operations. Commonly grazed forages can be deficient in several essential minerals required by ruminants to maintain adequate health (Kappel et al., 1985; Greene, 1997).

Many international and domestic forage and cattle mineral surveys have reported P (Salih et al., 1983; Greene, 1997; Gizachew et al., 2002; Ndebele et al., 2005; Almaráz et al., 2007) and Na (Kiatoko et al., 1982) deficiencies. Mathis and Sawyer (2004) reported multiple deficient forage mineral concentrations in a New Mexico survey, in which more than 90% of forage samples were reported deficient in P and Na for lactating cows and 9% of the samples were deemed deficient in forage S for all beef cattle. An Arkansas survey indicated Na was highly deficient, with less than 10% of samples considered adequate (Davis et al., 2002). In addition, Salih et al. (1983) reported deficient P concentrations in 40% of the serum samples from various herds located in 4 regions of Florida.

Soil, water, forage, and beef macromineral status of Louisiana cow/calf operation systems is largely unknown. The state was not included in a national comprehensive forage analysis from cow/calf herds in 18 states reported by Corah and Dargatz (1996). The objective of this research was to assess the macromineral status of Louisiana beef cattle, forages, soil, and water. Obtaining baseline data will allow Louisiana and other southeast beef-cattle producers to more effectively design macromineral supplementation programs.

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MATERIALS AND METHODS

Study Areas and Sampling Design

The Louisiana State University Agricultural Center Animal Care and Use Committee approved (AE 05–11) all animal procedures. The 2-yr survey was initiated during the fall of 2007 and ended during the spring of 2009. For sampling purposes, Louisiana farms (n = 25) were identified across 7 geographic regions (Figure 1): the northwest (**NW**; n = 5), northeast (**NE**; n = 3), central (**CE**; n = 4), southwest (**SW**; n = 3), south central (**SC**; n = 4), Florida parishes (**FP**; n = 2), and southeast (**SE**; n = 4) regions. The regions represent 7 different watersheds across Louisiana. Except for one producer from each of the NE and SE regions that only collected forage samples, all producers collected forage, serum, soil, and water sample. Forage was collected quarterly from August to September, November to December, February to March, and May to June. Five British/Brahman-influenced, spring-calving, primiparous cows were randomly selected at each farm and bled twice annually for 2 consecutive years, totaling 4 collection periods for sera mineral determination. Each year, the cows were considered to be bred by the owner; however, many farms did not have adequate facilities for palpation. Although our anticipation was to identify equal numbers of farms that either provided free-choice mineral or not, our data set was heavily skewed toward those who supplemented. The sampling periods included fall/winter (August–December) of 2007 to 2008 and spring/summer (January–June) of 2008 to 2009. Soil and water samples were collected once annually in 2007 and 2008 from August to May.

Because of hurricanes in 2008, south Louisiana was affected by wind, storm surge, and flooding and the central and northern regions endured flooding and wind damage. Therefore, fewer samples were collected in the fall and winter of 2008. Additionally, serum samples were not collected from one producer in the NE and CE regions in spring 2009. Missing forage samples included 1 in the SE region in February to March 2008, 2 samples in the CE region in August to September 2008, 1 in the NE and CE regions for the November to December 2009 sampling period, and 1 in the CE and SC regions in February to March 2009. Numbers of samples of serum, forage, soil, and water collected by years are reported in Table 1.

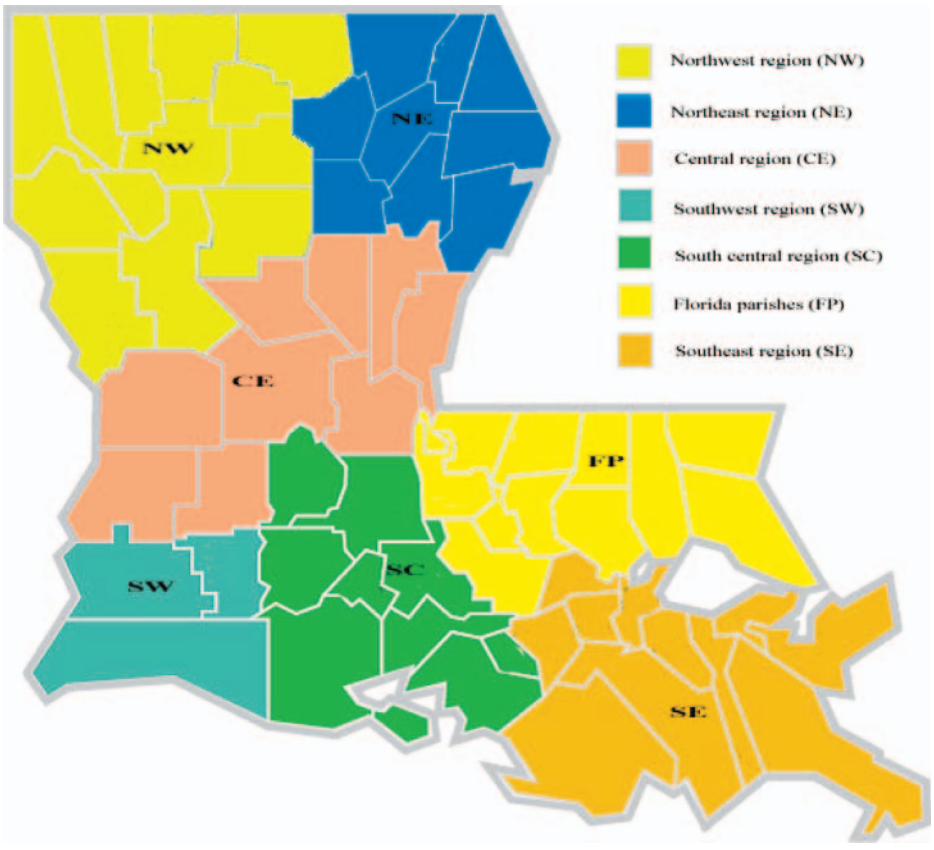

Figure 1. Geographical distributions of mineral survey participants. Color version available in the online PDF.

Forage, Blood, Soil, and Water Sampling

Coccygeal blood was collected into 10-mL serum collection tubes (BD Vacutainer, Franklin Lakes, NJ) and kept on ice, until centrifugation at 2,000 × *g* at 0°C for 20 min. Five hand-plucked forage samples were collected within pasture of cattle locale, separated from any root material and soil, combined, and placed into collection bags. Forages included bermudagrass (*Cynodon dactylon*), bahiagrass (*Paspalum notatum*), and annual ryegrass (*Lolium multiflorum*) individually or some combination of the 3, along with other vegetation (legumes and weeds). Primarily during winter months, producers provided hay with available forage; in this case extra samples were collected. Hay samples were collected from cattle operations, when no grass was available. However, macromineral concentrations of grass and hay samples within operations were not different and were combined into one sample. Soil samples were collected similar to forage, in 5 to 6 pasture locations where cattle were grazing at time of collection. Samples were taken at a depth of 8 to 12 cm. Water samples were collected using clean plastic bottles or plastic collection tubes and sampled from water troughs in cattle pastures. A minimum of 50 mL of water was collected from each farm.