ASSESSING THE POTENTIAL OF CO-GRAZING SMALL RUMINANTS WITH BEEF CATTLE TO IMPROVE UTILIZATION OF MARGINAL PASTURELANDS IN VIRGINIA

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Abstract

Reclamation efforts in the Appalachian coal field region have successfully resulted in areas that are suitable for livestock enterprises. Often these areas are underutilized due to increasing infestation by invasive species that reduce pasture utilization by cattle. The steep topography and low economic returns from cattle make invasive vegetation control by mechanical or chemical means unviable. Goats may be an economically viable alternative for improving utilization of these marginal lands. Goats select a diet mainly of browse and are considered an ideal species for mixed grazing with cattle. In spring 2006, an experiment was initiated at Powell River Project near Wise, VA, to compare the effects of co-grazing cattle and goats, cattle alone, and an ungrazed control on forage mass and botanical composition. Experimental design was a completely randomized design with three replications for the grazed treatments and two replications for the ungrazed control. Initial results indicated greater pasture utilization for the co-grazed treatment. The weed component of the sward was lower in both co-grazed and cattle treatments (14.5% and 16.0% respectively) compared to the ungrazed control (44.4%) by the end of the grazing season. These initial data indicate that co-grazing goats and cattle could help to achieve and maintain a desirable balance of herbaceous and shrub species that are desirable for co-grazing and would increase the overall productivity of reclaimed mined land pastures in the southeastern United States.

Introduction: Although much of the land that is created by coal-mining operations is restored to a condition that is suitable for livestock grazing, these lands are sometimes abandoned from grazing due to difficulty in controlling woody vegetation. The use of co-grazing systems to improve pasture utilization that is infested with undesirable species can produce economic benefits for producers by enabling expansion of grazing activities to marginal landforms, which could not otherwise be fully utilized. This practice takes advantage of different feeding habits between grazing animals that may result in improved pasture conditions for one or more livestock species. Increased animal performance and output per land area are possible (Allen and Collins, 2003). Goats are particularly useful in co-grazing systems with cattle. Goats prefer browse and weed species whereas cattle prefer grasses and legumes (Ball et al., 2002). Likewise, the grazing habits of goats may reduce the need for chemical or mechanical vegetation control methods on steep hillsides. Research conducted in North Carolina has shown that mountain hillsides infested with multiflora rose (*Rosa multiflora* L.,), black locust (*Robinia pseudoacacia* L.,), and other undesirable vegetation can become dominated by

grasses and legumes within four years of co-grazing goats with cattle (Luginbuhl et al., 1999; 2000). In addition, the demand for goat products has increased in recent years (Glimp, 1995). The sustainable use of co-grazing goats with cattle could improve utilization of available vegetation and improve farm productivity in the coal mining regions of Appalachia. The objective of this study is to compare the effects of co-grazing cattle and goats, cattle alone, and an ungrazed control on forage mass and botanical composition.

Materials and Methods: In spring of 2006, an experiment was initiated at the Powell River Project in Wise, VA, to compare the co-grazing of goats with cattle vs. cattle only grazing on pasture mass and botanical composition. Treatments included: an ungrazed control, cattle only, and co-grazing. Experimental design was a complete randomized design with three replications for the grazing treatments and two replications for the control. Three crossbred steers (*Bos taurus*) (average BW = 648 lb) were assigned to each grazing treatment, with the stocking rate (0.67 steers acre^{-1}). Fifteen Spanish crossbred bucks (*Capra hircus*) (average BW approximately = 46 lb) were added to the co-grazing treatment. Pastures were managed under rotational stocking. Pastures were grazed for two weeks and rested for four weeks. All animals were treated for internal parasites and trace mineral salt was provided free choice.

Pastures were sampled three times (spring, summer, and fall) during the grazing season. Forage mass was determined by clipping four, 2.69 ft² areas per control treatment and eight, 2.69 ft² areas per grazing treatment. Prior to harvesting, botanical composition was determined visually using the Double DAFOR scale (Brodie, 1985; Abaye et al., 1997). This scale ranks the relative abundance of species where D=dominant, A=abundant, F=frequent, O=occasional, and R=rare. There are two DAFOR scales, one for forages and one for weeds. In addition, percent ground cover, grass, legume, and weed were visually estimated. Sericea lespedeza [*Lespedeza cuneata* (Dum.-Cours.) G. Don] was considered a weed in this experiment as it is not favored by cattle during a large part of the year due to its high tannin content (Dove et al., 1997). All data present was subjected to the general linear models procedure from SAS (SAS Institute, 1982). Factors included in the model included season, treatment, and season x treatment. Differences were considered significant at $P<0.05$.

Results and Discussion: A significant grazing treatment x season interaction occurred. Therefore results are presented by sampling date. The general differences of the pastures after livestock was removed were very apparent. In the co-grazed, total vegetation was utilized more uniformly than in the cattle alone treatment. Goats browsed autumn olive (*Eleaganus umbellata* Thunb.) shrubbery aggressively (Fig. 1). Forage mass differed between treatments for all sampling dates (Fig. 2). In the spring (initial sampling) there was no difference in biomass yield among the co-grazed and cattle treatments (Fig 2). In mid-summer, generally the overall biomass yield increased mainly due to the summer species (such as sericea lespedeza). After two cycles of grazing by cattle and co-grazed, biomass yield decreased significantly compared with the ungrazed control. Furthermore, biomass yield was significantly lower for co-grazed compared with cattle or the ungrazed

control. Although differences were much lower, the same trend was observed at the end of the grazing season (Fig. 2).

Visual assessment of botanical composition of the sward indicated that earlier during the grazing season, the dominant fraction of the sward appeared to be grass and weeds (including sericea lespedeza) with smaller amounts of desirable legumes (Fig. 3.). However, by the end of the grazing season, the grass component of the sward was significantly higher in co-grazed treatment compared to ungrazed control probably due to goat preference for weeds allowing grasses to occupy more area and take advantage of available light and nutrients. Weed components of the sward was reduced for cattle and co-grazed treatments compared with the ungrazed control (Fig. 3). Luginbuhl et al. (1999; 2000) found similar results under co-grazing cattle and goats in North Carolina.

Initial results from the current study indicate that co-grazing by goats and cattle could more effectively utilize the complex mixture of herbaceous and woody vegetation commonly found in reclaimed mined land pastures in the southeastern United States. This could increase animal production per unit area and improve the profitability of this marginal land resource. More work is needed to determine stocking densities and ratios that will maintain a desirable balance of herbaceous and woody vegetation capable of supporting sustainable co-grazing systems.

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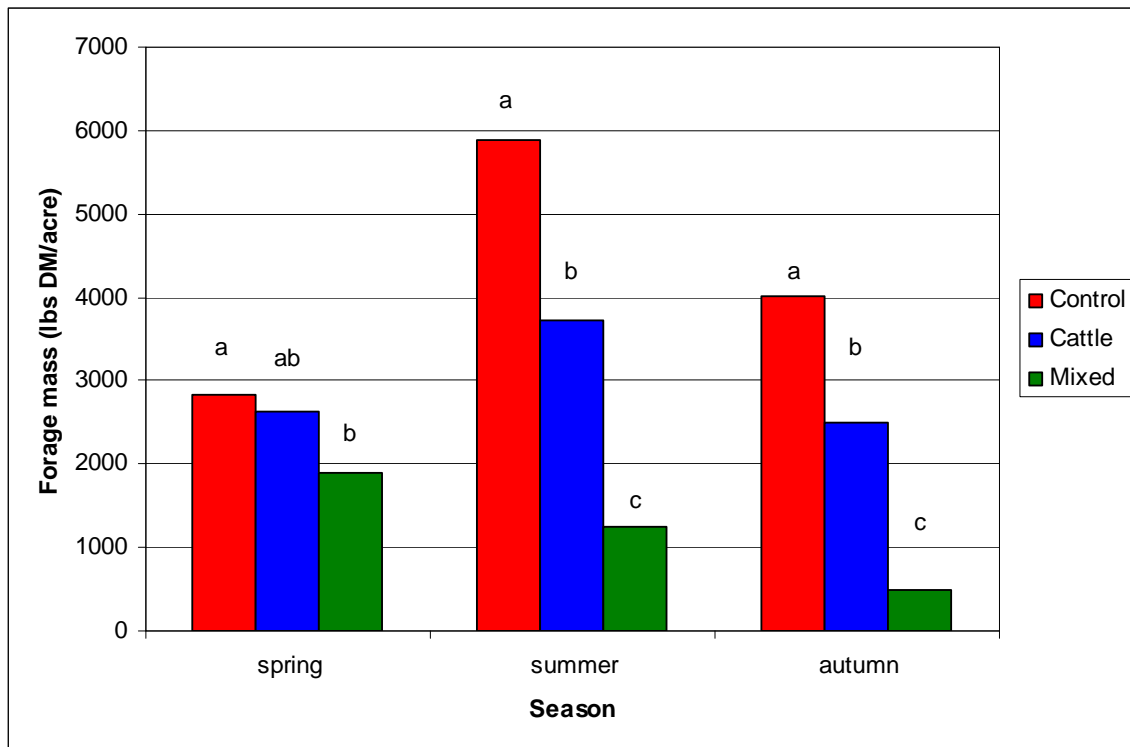Figure 1. Goats browsing autumn olive shrub.

Figure 2. Effect of co-grazing vs. cattle alone grazing on herbaceous mass over seasons. Means for bars within seasons followed by the same letter are not significantly different (DMRT, P = 0.05).
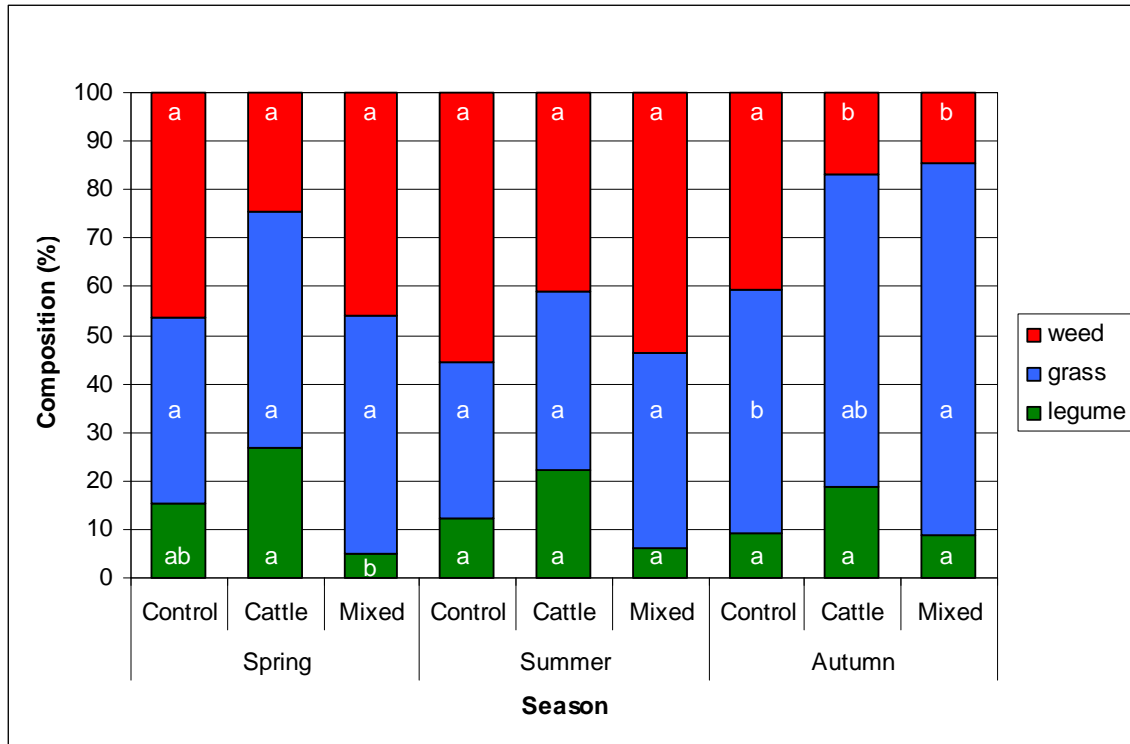
Figure 3. Effect of co-grazing vs. cattle alone grazing on botanical composition over seasons. Means for bars within seasons followed by the same letter are not significantly different (DMRT, P = 0.05).