

Competitive Research Grant Program**Grazing conservation tillage corn with steers in an agroforestry environment: Advantages for land owners, wildlife and timber producers**

Investigators: Rhonda Vann, Animal and Dairy Sciences; Glover B. Triplett, Plant and Soil Sciences; Jeanne C. Jones, Wildlife and Fisheries; Deborah A. Gaddis, Donald L. Grebner, Forestry

Project Goal:

The goal of this project is to develop an integrated production system incorporating corn, cattle, wildlife, forestry and economic incentives that are ideally suited to landowners, including limited resource landowners.

Project Objectives:

1. Continue development of the corn grazing system to include crop production methods, evaluation on different sites, and determining livestock performance.
2. Measure the amount of waste grain, and lead shot pellets on the soil surface available for wildlife consumption in clean-farmed cornfields versus no-till, corn grazing fields.
3. Measure the percent coverage of naturally colonizing plants in clean-farmed and no-till corn grazing fields and categorize according to wildlife food use, with emphasis on upland gamebirds (wild turkey, northern bobwhite, and mourning dove).
4. Measure and compare the response of selected wildlife species (mourning doves and selected mammals) in corn grazing systems and areas not treated by corn grazing systems.
5. Determine crop contents of harvested mourning doves in clean farmed and no-till corn grazing systems to ascertain

food items taken by doves in the two different treatment types.

6. Measure hunter person-days and number of doves harvested per hunter person-day in clean-farmed cornfields versus no-till corn grazing systems.
7. Measure the growth response from thinning and application of chemical nitrogen fertilizers and animal manure nitrogen to 3-year-old and 10-year-old pine stands.
8. Utilize revenue production information from previously funded research on wildlife enterprises at Mississippi State University to predict income production potential from fee hunting for mourning doves, beef production on no-till cattle grazed cornfields, and timber yields to assess total economic returns possible for private landowners.

Synopsis of research activities per objective:

1. Three steer/heifer-grazed sites and three conventionally managed harvested sites existed in three counties of Mississippi in 2007. Sites were located in Oktibbeha County at the Mississippi State University Dairy Research Center in Starkville, Lafayette County on private land in Oxford, and Newton County at the Mississippi State University Coastal Plains Branch Experiment Station in Newton. Cattle began grazing starting in mid-August and ending in October or

early November. These cattle were weighed prior to corn grazing and every four - five weeks until removal of the animals from the corn. After harvesting corn sites, cattle were sent to feedlots, sale barns, and slaughterhouses. Average daily gains, feedlot days, and quality carcass grades were analyzed and compared to traditional methods of growing cattle

2. Corn yield on each field was estimated prior to grazing or combine harvest. Residual corn was sampled 4 - 5 weeks after initiation of grazing on steer/heifer grazed sites or after harvest on conventionally managed sites, which generally occurred in mid to late September. Residual corn was sampled again in late October and January.
3. In each field, vegetation was measured using line transects to assess species composition and percent coverage of dove food plants and bare soil surface.
4. Mourning doves and songbirds were monitored using point count stations. White-tailed deer and incidental species were monitored using digital wildlife field cameras, 2 per field.
- 5/6. Corn-grazed cattle performance was compared to Bermuda grass-grazed and feedlot-fed cattle. Mourning dove hunting rates in Mississippi were used to determine profitability of hunting on these grazed sites. Profit from



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cattle sales and dove hunting information were used to evaluate economic feasibility of this production system.

7. Trends in volume growth and stem density from 2004 to the present are summarized for individual stands within the two (North and South) agroforest research areas located on the John Starr Memorial Forest. Volume estimations in the North Research Area have generally increased for each of the individual rows, as well as, on a per acre basis. The North Agroforest Area and the North Positive Control are both currently averaging approximately 0.5 cords per acre per year (0.88 and 0.47% volume growth per year, respectively). The North Negative Control averaged 3.6 cords per acre per year (3.4% per year volume growth) from 2004 to 2007. Mortality rates were low for the North Research Area, averaging an overall loss of about three tenths of a percent in total number of stems. In 2006, fire and mechanical disturbances were noted as affecting stem density and overall acreage of the two controls in the North Research Area. Stem density in the South Research Area increased by an average of approximately 0.66 percent over the three-year growth period. The South Negative Control showed the largest increase in stem density (1.59%) over the measurement period followed by the Positive Control (0.38%). Stem counts in the South Agroforest stand have

remained stable with only a 0.01% percent increase in the total number of stems since 2004. Volume estimation for stands in the South Research Area began this year and will be the baseline by which future changes in per acre, per row, and total volume are determined.

Significant findings/results per objective to date:

1. Corn yield averaging 5,600 kg/ha steer-grazed sites and 6,300 kg/ha on conventional-harvested sites were used to determine stocking rates. On average, steers had a beginning weight of 339 kg with an ending weight of 414 kg yielding an average daily gain of 0.90 kg/day. Feedlot days were not recorded for 2007 because all cattle were sent to sale facilities directly from corn grazing. Quality grades on steers sold to the MSU meat laboratory equaled 50% Select and 50% Standard.
2. Corn yield averaging 5,600 kg/ha on steer-grazed sites and 6,300 kg/ha on conventional-harvested sites were used to determine stocking rates. Biomass of residual corn kernels on the soil surface was greater on steer-grazed sites than on conventional-harvested sites in late summer ($P < 0.05$) and late fall ($P < 0.025$).
3. Percent coverage of grasses and forbs was higher in steer-grazed sites than conventional-harvested sites in late fall



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following harvest of corn with coverages of grasses and forbs being >10% in steer-grazed sites and < 5% in conventional-harvested sites. Percentage of bare ground was greater on conventional-harvested sites (50% - 80%) than on steer-grazed sites (1%-13%) in all seasons of 2007.

4. Dove numbers remained greater on steer-grazed sites compared to conventional-harvested sites ($P < 0.05$). Across all sites and months for the year, doves ranged from 0 – 279 with a mean of 28 on steer-grazed sites, and 0 – 3 with a mean of 0.4 on conventional-harvested sites. White-tailed deer numbers, monitored using digital wildlife field cameras, remained greater on steer-grazed sites when

compared to conventional-harvested sites ($P < 0.05$).

5. Steer weight gains were greater than Bermuda grass-grazed steers ($P < 0.0220$), but less than Mississippi feedlot steers ($P < 0.0227$). After offsetting costs of field preparation, fencing, and cattle needs, landowners using this production system can increase income by at least \$450/ha from lease hunting and production of quality beef cattle.

Unrealized or unsuccessful endeavors of project:

Study sites differed in 2007 from 2005 and 2006 due to university plans for these fields, and new sites in the same region of the state were established. Also, quality grades and

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feedlot days in 2007 could not be acquired because all cattle were sent straight to feedlots from corn-grazing.

Applications or broader impacts of significant findings:

The increase in corn yields may have a greater economic impact than it would seem on the surface. With the increased price of natural gas as well as all other crop commodities, fertilizer and etc., corn producers in the northern climates are faced with drying costs for corn. This increases the production costs over the current value of the corn. In addition the increased push for ethanol production has greatly impacted producer costs to an all time high. These practices could possibly help offset those increased expenses. Livestock feeding costs are expected to accelerate, making growing/finishing systems such as this project much more attractive to producers and the industry.

Project success relative to original objectives:

This project has met each stated objective. Other environmental benefits were also discovered including: corn fields used for grazing are exempt from confined animal feeding operation regulations, animal waste/nutrients are returned to the land vs. lagoons for feedlot operations, and landowners may choose to take advantage of a niche market, for example:

natural beef, where early-maturing, small-frame animals are ready for harvest directly from corn-grazing. Wildlife habitat is improved in these agricultural settings for many southeastern species.

Graduate Students:

Manning, D. 2005. Upland game species use of no-till corn sites harvested by steers in a pasture and agroforestry setting in east central Mississippi. Thesis, Department of Wildlife and Fisheries, Mississippi State University.

Manning, D. 2008. Doctoral student, expected graduation 2008.