

## **KUDZU-GOAT INTERACTIONS-A PILOT STUDY**

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### Introduction

The production and processing of forest products is a major industry in the State of Alabama. Current weed management and control practices rely heavily on the use of herbicides. With the risk of soil and water pollution associated with the use of some agricultural chemicals, the continuing use of such chemicals may become hazardous to human health. The need for developing integrated weed control methods with less use of herbicides can therefore not be overemphasized. One of the most aggressive competitive vegetations in southeastern forestlands is kudzu. The dominance of kudzu on over a million acres of forestland has made potentially valuable pine-producing land unusable. The most common control method is the use of chemicals.

Grazing Angora goats on these forestlands may offer an alternative for controlling competitive vegetation while providing extra income to farmers from the sale of mohair. There is a lack of information on the interaction of kudzu and the Angora goat. The need therefore exists for the development of data on management practices relative to grazing, stocking rates, disease management and effects of the grazing on the goats as well as the interaction of the goats with newly planted pine and other desirable forest species.

The purpose of this study is to determine the effectiveness of grazing Angora goats on control of kudzu and its effect on newly planted pine trees. This is a joint study between Tuskegee University, the U.S. Forest Service, Southern Forest Experiment Station and the Tuskegee National Forest.

### Objectives

The purpose of this study is to determine the interaction among kudzu, Angora goats and newly established pine trees. The specific objectives are to determine (1) if grazing Angora goats can control kudzu, (2) if kudzu is an efficient and economical forage for Angora goat production, and (3) the effects of grazing goats on the regeneration of loblolly and longleaf pine.

## Materials and Methods

This is a three-year project that started in July 1990. The study area is located off Highway 29 between Auburn and Tuskegee on the Tuskegee National Forest. The specific site is located in Section 21, Township 17 North, Range 24. About 1.2 ha of this plot was divided into two treatment units with goat stocking rates of 10 and 20 goats/ha (Fig. 1). The site was previously a longleaf pine plantation that was clearcut in 1983 and treated with site preparation herbicides: Oust in 1984 and Roundup in 1985, 1986 and 1988. The site is presently planted to year old loblolly and longleaf pines. It is heavily invaded with kudzu. The study area is relatively level, devoid of any woody vegetation or trees except in the southeastern corner where the catch pen - shelter corral was located. Within each stocking rate, six plots 9x9 m each were established; three of each were enclosed and the other three were opened to the goats for grazing. Each of the 9x9m plots had a total of 15 loblolly seedlings. Control plots within the areas of different grazing intensity were established to compare grazed with non-grazed areas. Data on trees were taken on survival, height growth, crown spread, vigor, stem diameter, animal damage, change in dominance, and reasons for loss. The animal measurements taken included monthly animal body weight, feed intake, fecal composition, mohair production, quality and grade. Data on kudzu included fiber content, lignin, ash, % nitrogen and % crude protein. Also, forage yield and % ground cover and regeneration were determined.

Precipitation was monitored using a standard rain gauge. The site was also classified according to soil type and composition. In addition, soil samples were taken to determine the pH where there was heavy kudzu infestation. Soil samples at different depths (0-10, 10-20, 20-30, 30-40 and 40-50 cm) were taken from root areas of soils infested with kudzu and their pH was compared with areas devoid of kudzu growth. Kudzu and other plant materials were measured monthly in both enclosures and exclosures. The rate of utilization of the forage present at each site was calculated by comparing the reduction in coverage and dry matter production between enclosures and exclosures. The change in botanical composition was also monitored. Plant species utilized by the goats include grasses, grasslikes and forbs. Any changes due to kudzu control were also recorded. Kudzu was analyzed for acid detergent fiber (ADF), neutral detergent fiber (NDF), lignin, ash, % nitrogen (%N) and percent crude protein (%CP) content. The first meter of each vine was divided into 25 cm sections and leaves and stems separated and analyzed.

Field measurements of pine trees were taken monthly prior to the introduction of the goats to the area; thereafter, immediately following the completion of the study.

The measurements include the following:

Survival-	the percent of living trees as compared to total planted.
Height growth-	the height of the seedling from groundline to terminal bud measured to the nearest inch.
Crown spread-	the average diameter of the crown to the nearest inch measured in a north-south and an east-west diameter.
Damage to pine-	ranked on a 0 to 3 scale with 0 = no damage, 1 = light damage (less than 1/3), 2 = moderate damage (1/3 x 2/3), 3 = heavy damage (over 2/3). Damage is amount of the pine consumed.
Type/Cause of damage-	of the damage categories are also ranked as shown below

The 9m x 9m plots were stratified and were located 1/4, 1/2 and 3/4 of the distance on the baseline of the triangular grazing section. Each plot was mapped for future reference. All pine measurements were taken prior to introduction of the goats, monthly, while the goats were in the area, and immediately following the removal of the goats.

Goats were introduced into the study area in September 1990, and they remained on the site until October 1990 when they were moved to the facilities on campus. They will be reintroduced into the study area when sufficient kudzu is produced to maintain the herd in the spring in May. Goats will graze from spring to fall (May - October) each year during 1991 and 1992. The goats were housed each night for protection.

Supplemental feed was provided during the winter months. Mineral supplements were provided all year and protein and energy supplements were provided when needed to meet the animals' daily requirements. Animals were treated periodically for internal and external diseases and vaccinated against diseases common to goats in the areas. Comparison of the performance of the trees in controlled versus grazed areas will be made using a paired T test to determine if a significant difference exists. Descriptive analysis of the differences in the means will be made.

### Preliminary Results

The following is a summary of the 1990 preliminary results.

#### Goat Management, Grazing, Care and Measurements

Fifteen castrated Angora males (wethers) were introduced in the study area on September 14, 1990 and remained until October 26, 1990 after the first

frost when they were moved back to the campus facility. Before introducing the goats to the study area, they were sheared, identified with goat tags, checked for lice, dewormed and weighed. Fecal samples were collected and analyzed for the number and types of parasites present to confirm effectiveness of the deworming treatment. The 15 goats weighed an average of 20.6 kg and yielded an average of 2 kg/head of mohair at the beginning of the study. They were then randomly assigned to one of two treatment groups: (I) stocking rate of 10 goats/ha (GPI) and (II) stocking rate of 20 goats/ha (GPII).

The average weight gain per unshorn animal for the study period was 8.4 kg for GPI animals and 9.0 kg for GPII animals, a daily gain of 0.16 kg and 0.18 kg/head, respectively.

The body condition score (CS) was obtained at the end of the grazing period. The CS provides a method of comparing the overall health and amount of flesh covering the bones of the goats. The CS values range from 1-10 with 1 indicating a very thin and emaciated animal to 10 being an obese and very fat animal. The CS value for GPI was 5.0 with a range of 4-6 and that for GPII was 5.3 with a range of 4-6. Both groups were in good, healthy condition.

#### Forage Quantity and Quality

A simulation model was used to predict the amount of dry matter during the grazing period. Several assumptions were made: (a) that the factors that influence understory vegetation remain constant; (b) that timber management practices will not change over the projected period; (c) that the growth rate of kudzu plants followed the usual growth rate of forages in general and the plant growth is between March and September; (d) that grazing will not start until May 1; and (e) that growth is linear in ungrazed paddocks but exponential in grazed paddocks.

The predicted model showed that there was enough dry matter available to sustain the animals throughout the grazing period while meeting their nutrient requirements. It also showed that the animals would lose weight for a very short period toward the end of the grazing season. However, the model has to be validated next season when the animals are introduced in May.

Preliminary nutrient analysis of different sections along the first meter length of the kudzu vines from the tip show differences in the nutrient content. Neutral detergent fiber in the stem increased from 44.4 to 57.8% and acid detergent fiber increased from 27.8 to 39.1% as sampling moved from the growing point (0-25 cm) to the 75-100 cm section. While NDF and ADF decreased, ash and crude protein content were highest at the growing point and decreased from that point along the stem of the plant. Ash and CP in the leaves increased from the growing point along the stem while NDF and ADF decreased.

## Soil Properties

Preliminary results indicate variations in bulk density among the sites sampled. The soil pH also varied depending on soil depth as well as areas with or without vegetation cover. Results of the soil nutrient contents have not been analyzed.

## Grazing Effects on Year-old Pine Trees

Plant height, spread, crown class and vigor decreased when the animals were introduced in the study area due to the damage caused by grazing on some of the trees. The percent damaged trees increased with increased length of period that the goats remained in the study area. The percent survival in the control plot was higher (80%) than the grazed plots, (30% for high stocking rate and 55% for the low stocking rate.) A prolonged drought might have caused further reduction of the percent tree survival in the grazed plots. The survival of the loblolly pines was much better than the longleaf pine. This might have been due to poor planting stock of longleafs or poor planting technique. Preliminary observations indicate that goats will browse on pine seedlings.