

# Estimating the Sustainability and Productivity of a Meat Goat Operation on New York Pastures

## Final Report for FNE99-276

Project Type: Farmer

Funds awarded in 1999: \$6,286.00

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Matching Non-Federal Funds: \$32,200.00

Region: Northeast

State: New York

Project Leader:

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## Project Information

### Summary:

(Note to the reader--attached is the complete final report for FNE99-276)

The overall objective of the study was to evaluate the sustainability and productivity of the meat goat management system that had evolved over time on our farm. The hope was to obtain some real figures that would be helpful to other pasture-based meat goat operations.

Goats are effective eradicators of woody plants. It is often assumed that their presence on a pasture will be transient, i.e., they will move on once the browse is eradicated. However, many meat goat producers cannot readily convert their goat-improved pastures to another farm enterprise or continually move their goatherds to new farm sites. Our forage management system developed in an attempt to 1) utilize improved pastures without letting our goats accumulating the dangerous worm loads associated with such pastures, and 2) sustain browse in our remaining brush pastures for as many years as possible.

The pasture-based system on our farm relied on winter drylots with barn access from mid Dec through April, rotational grazing of conventional pastures from May through July, month-long grazing of two brush pastures Aug through Sept, and strip grazing of hay field regrowth from Oct until mid Dec. Two horses followed the goats through the conventional pastures and continued to rotate through these same pastures in August and September.

To evaluate how ecologically and economically sustainable the model was, we needed to determine:

- a) How the pasture ecology changed from year to year and season to season in both conventional and brush pastures. (Did the ratio of desirable plants decrease? Was it possible to maintain brush plants?)
- b) How the quality and quantity of pasture varied seasonally and annually. (How many breeding does and offspring could be maintained per acre depending on the

season, year, and the doe's stage in pregnancy/lactation.)

c) How fecal worm counts and incidences of severe anemia varied as goats passed from winter drylots to conventional pastures to brush pastures to grazing hay field regrowth. (How effective was chemical deworming during these different management stages?)

d) The productivity of a group of does maintained under this pasture-based system. (What were the growth rates, dressing percentages, and mortality rates of their kids? How did rates of weight gain and loss vary between does with single kids and multiple births? Between yearling does and mature does? How did income per doe vary?)

e) Major labor and financial costs of running a small meat goat farm.

### Farm Description

The farm remains a meat goat operation and none of the areas that were fallow at the beginning of this research grant have been incorporated into the enterprise. At the initiation of this grant, I reported having 54 acres of which 8 acres were in fenced pastures and 15 acres in hayfields. We were better able to measure the acreage during the study. In reality, the farm has about 10 acres in fenced pastures and 14 acres in hay fields (East hay field - 5 acres, West hay field 9 acres). We still run ~30 breeding does and their kids. In 2003, we maintained 35 does. However, in 2004 we plan to again freshen only 30 does as our indoor barn space (500 sq. ft.) is too crowded when more than 25 - 30 goats freshen during our early April kidding season.

During the second year of our project we built an inexpensive outdoors feed rack for our round bales that decreased our winter hay wastage and built a three-sided addition to our hay barn that increased our winter hay storage capability.

Drs. Dan Brown and Deborah Cherney, Cornell University Animal Science Department, provided advice on pasture management, and forage sampling and evaluation. Both of them also participated physically in the forage surveys conducted twice yearly on the grazed lands. Deborah Cherney presented data from the first year of the study during a goat pasture management workshop at the 1999 Caprine Outing. Dan Brown in consultation with parasitologist, Dr. Dwight Bowman, advised on presentation of the fecal worm count information.

Certified foresters, Dr. Peter Smallidge and Don Schaufler, walked the wetland and brush sections of the pastures each year and advised on browse physiology. They participated in the annual sampling of the wetland area.

Three different people held the Cornell Cooperative Extension grazing specialist position for our region of NY over the duration of this study. Greg Albrecht helped out with the initial planning of the project and first soil samples. Kathy Finnerty toured the pastures and provided her input at the end of the first year. Dan Demaine walked and advised on the pastures the second year and organized the farm field day at the study's end. He took the final soil samples.

We kept track of plant species changes in the 3 grazed areas (conventional pastures, brush pastures, hay field regrowth) by doing a "step point transect survey" twice yearly of each field. Two random transects were assigned per field. In the case of rectangular fields, one transect or line ran across the field from the North to South fence lines, the other from the East to West fence line. Triangular pastures were "crisscrossed" as best as possible. We then put permanent markers at the point where each transect intersected the fence line so that the same transect could be sighted along and evaluated for each survey. The fields consisted of 5 conventional pastures ranging from .94 to 1.51 acres; two brush pastures

ranging from 1.48 to 2.54 acres, and one hayfield of approximately 5 acres. A farm map is available in Appendix 1.

Surveys for the conventional pastures and hay fields were done 5/11/99, 11/12/99, 5/16/00 and 11/14/00. The brush pastures were surveyed 5/25/99, 11/12/99, 5/16/00 and 11/14/00. The procedure consisted of one person carrying a thin metal rod and walking the designated line. Every 2 to 4 paces depending on the size of the field, the person would place the rod at the tip of their shoe and report which plant species the rod first encountered. The accompanying person would record this plant species. In some cases only bare ground, plant stubble, or manure was encountered. These occurrences were also recorded. The results were then compared across two seasons and years.

One hedgerow and one brushy wetland that had been severely girdled by goats in earlier years had small subsections of them chain sawed at the crown in January 1999 to see if such pruning would stimulate sprouting of suckers within the predated plant species (willow, red-stem dogwood and honey suckle. Photos of the various treatments were taken in late spring and the plots visually evaluated by two certified foresters. In addition, the large brushy wetland area (located in Pasture 7) had a transect sighted along its entire length. Eight equally spaced points were pinpointed along this line and marked with fiberglass posts. On 8/8/99 and 8/3/00 immediately prior to the goats being brought into the pasture, the wetland was surveyed using "point intercept measurements".

An 8 ft pole was held upright at each point and used to determine the health of the vegetation as measured by height and density. The pole was marked at foot and inch intervals. These marks were used to 1) determine the height of the tallest brushy plant present at the point, and 2) estimate the percentage of coverage of each plant species present at the point within its habitat level. For example, if a berry bush was present at that point and inhabited the lowest 3 feet of the pole, how densely did it cover these respective three feet ?

#### Forage Productivity

Productivity of the grazing areas was measured by taking approximately 3 plant samples (1 sq. ft. each) per acre as goats entered each field. These samples were taken by randomly flinging a wooded "L" across the field. The "L" was made of plywood and each "arm" was 1 ft in length. The "L" worked well on tall herbs such as golden rod and dogwood as it was easy to slip over them for sampling. These plant samples were used to calculate wet and dry matter weights.

Approximately two 4 ft x 4 ft mobile exclusion cages per acre were erected in each field as the goats entered in 1999. A sq. ft. of pasture in the middle of each cage was periodically trimmed to mimic goat-grazing behavior. For example, if the goats stayed in the pasture two weeks, the area might be trimmed at day 5, day 10 and day 14 to a similar length as that of the grazed area outside the exclusion cages. These samples were analyzed for nutrient composition through the Dairy Herd Improvement Lab in Ithaca, NY. However, exclusion cages were not used in 2000 because each conventional field was further subdivided in two and grazed for only 1 week at a time. It was theorized that there would be too little regrowth in a 1 week period to warrant the time and labor of moving the cages from field to field. (The first year had been relatively dry and little regrowth had been noted on trimmed swaths after the first "manual trimming to mimic grazing". Of course, the second year was much wetter and we sometimes regretted not having used the exclusion cages!). Instead, the initial plant samples taken as goats entered a field were used not only to estimate wet and dry matter but also for the nutritional analysis in 2000.

#### Worm Control

Fecal samples from a representative 10% of the herd were taken about 1 week before goats were moved to a new forage management area, for example, from conventional pastures to brush pastures, from brush pastures to hayfields, from hay fields to dry lots. They were also taken prior to kidding and weaning or anytime chemical worming was contemplated. In most cases, fecal samples were also taken 7 to 10 days after worming. Although attempts were made to sample the same goats throughout a year, the assigned goats often conspired against us. If a doe yielded no feces, a doe of similar age and body condition was substituted for her. Fecal samples were analyzed for worm and coccidia eggs through the Cornell Diagnostic lab, except for twice when Tatiana Stanton and Jennifer Ketzis ran the samples themselves.

### Doe Productivity

Does and kids were weighed and average daily weight gain (or loss) calculated 1) each time they were moved to a new forage management area and 2) at least once monthly within these management areas (generally corresponding to a move to a new pasture subdivision). Kids were also weighed at birth, weaning and upon sale or slaughter. Individual doe records also recorded litter size, kids reared, etc. Records were kept on the prices and quantity of winter hay fed and on supplemental grain fed. Other financial expenses were also recorded as well as price received for the sale of meat or goats.

### Project Results

#### Pasture Ecology

##### Step Point Transect Survey -

The results of the survey are shown in the five tables below and the accompanying bar graphs. It is important to keep in mind that the step point method measures the first plant encountered by the rod or essentially the tallest plant. Thus, it does not necessarily measure the density of the different plant species in a field. Our objective was to assert how much biodiversity existed in the pastures and changes in this biodiversity. We knew that if we conducted the surveys in late May or June, the grasses in the conventional pasture and the goldenrod in the brush pastures would tower over and “mask” many of the other plant species. We also knew we would confuse the survey if we timed it when some pastures had already been grazed and others had not. Therefore, our spring surveys were completed by mid May. The disadvantage of this is that plant species like Timothy and alfalfa were just starting to emerge and difficult to identify while others like vetch were not present yet. We conducted the fall surveys on November 12, 1999 and Nov 14, 2000, theorizing that this was as late in the fall as we could wait without risking major frost burn off of the forages. However, this was also late enough that the Timothy that was obvious in June and July was again absent or difficult to identify. Fall '00 was colder than Fall '99 and the pastures experienced some severe frosts prior to surveying unlike in Nov '99.

The surveys revealed substantial biodiversity even in the conventional pastures (Pastures 1 -5). They were very similar in composition to the East Hay Field (identified as Pasture 6). This was expected as prior to 1995 they had all composed one large uniformly managed hay field. The primary plant in Pastures 1 - 6 as measured as the tallest plant encountered was orchard grass regardless of season or year. However, bedstraw, dandelions and goldenrod were also well represented as “tallest plants” in most of these pastures at each sampling period. Forage legumes (primarily red clover and birdsfoot trefoil) were also well represented. The pasture composition changed from spring to fall, but the trends were rarely uniform from year to year. Poverty grass was an early grass identified in all the conventional pastures in May but never in November. However, the percentage of bedstraw as

the “tallest plant” increased substantially during the relatively dry growing season from the Spring 99 to Fall 99 and decrease sharply from Spring ‘00 to Fall ‘00 during a wet growing season/cold fall.

The wet growing season/cold fall of 2000 also likely explains the substantial “litter” recorded in Fall ‘00. This litter was composed primarily of decomposing grass stubble. The goats grazed the conventional pastures only through July each year and left much of the coarse stems particularly in Pastures 4 and 5. Two horses grazed the regrowth of the conventional pastures but had difficulty keeping on top of them. The severe frosts in Fall ‘00 as compared to Fall ‘99 appeared to have resulted in an early kill of some of the grasses in Pastures 1 – 6. Increases in dirt and manure sighting in Pastures 4 and 5 in Fall ‘00 can probably be explained by the horses staying 3 more weeks in this section of the farm in 2000 as compared to 1999 and in allowing them to overnight in these fields- a practice not allowed in 1999. Pasture 2 also showed an increase in dirt sightings in the fall of 2000 compared to 1999. In 1999, the buck kid herd was kept on Pasture 1 throughout the fall. In 2000, the buck kid herd spent 4 weeks on Pasture 2 and 6 weeks on Pasture 1. These changes in Pasture use may account for the changes in dirt sightings in Pasture 1 and 2 observed between the two years.

With the exception of Pasture 5 where buttercup was identified as the tallest plant 1% of the time in Spring ‘00 but not Spring ‘99, undesirable forages were fewer in 2000 than in 1999. We originally thought we had a toxic weed, Senecio, in the pastures. We followed the growth of the plant we identified as Senecio during the 2nd year of the survey and, at least for that year, the plant turned out to be daisy instead.

In truth, the step-point transect surveys did not reveal any blatant changes in the pasture ecology of our conventional pastures that could be easily attributed to goat grazing. Growing conditions from year to year and season to season probably explained much of the variation observed. Impact of the goats on the pasture ecology of these conventional pastures appears to be relatively minor. We would probably need to undertake these surveys for several years to truly isolate trends from their presence.

The sustainability of our brush pastures was dealt a blow in Spring ‘99 when a logging company in exchange for access through to a neighbors’ woodlot agreed to bush hog our fallow field (Field 9) and instead bush hogged our brush pastures (fences and all). They broke through many of our berry brambles and provided until-then-unavailable access to the core of these thickets for the goats. Unfortunately, the goats were then able to predate these thickets to a degree unpracticed before.

Both brush pastures had spring compositions primarily of golden rod as measured as the “tallest plant”. A variety of grasses, and unidentified “good’ forbs (some of these were other varieties of golden rod) were also well represented. Berry brambles made up about 10% of the sightings in Pasture 7 in the spring but were less represented in Pasture 8 and in the fall. Wild strawberries provided about 10% of the sightings in both pastures in Spring ‘99 but less in the wet spring of 2000. Both pastures were severely grazed for 3 to 4+ weeks each in August or September. This is probably responsible for the sharp decrease in golden rod and increase in dirt recorded in the fall compared to spring. Leaf and twig litter were also commonly reported as the “encountered plant’ in the fall. The presence of orchard grass in both pastures increased from 1999 to 2000. Red clover jumped to 20% of the sightings in Pasture 8 in Fall ‘00. Berry brambles were the most common woody browse reported. However, dogwood, honeysuckle, multiflora rose, black willow, maple and poplar were sighted. Woody browse made up ~15% of the sighting in Pasture 7 each spring but was less represented in Pasture 8. However, Pasture 8 has

a small wetland area at its entrance which was not included in the transect survey or in the later pasture analyses. This area was so thick at the time of the study that we could not easily measure its perimeter (the dogwood, willow and honeysuckle that predominated in it are now severely eaten back-2003). Undesirable forbs were rarely sighted in either Pasture 7 or 8 and remained about the same between years.

A fallow field adjoined these brush pastures. Prior to the inadvertent bush hogging of Pastures 7 & 8 we had planned to bush hog Field 9 each year and compare its changes to those of these goat browsed pastures. We did bush hog Field 9 each year but obviously could not make the comparison. It too was made up primarily of golden rod in the spring followed by a variety of grasses and good forbs. It was mowed each June and golden rod content dropped in the fall compared to spring. Unlike Pasture 7, the percentage of berry bramble sightings did not decrease from spring to fall probably because no goats were grazing the brambles in Aug/Sept. Leaf and twig litter increased in the fall as expected. We anticipated that the content of trefoil and red clover would increase over time based on what had happened to a path that had been mowed over time on the perimeter of this field. Trefoil sightings were rare but red clover did account for 6.5 % of the sightings in Fall '00 as compare to 0% at all other sampling periods. However, the sighting of orchard grass increased from 0% in Spring '99 to 20% in Spring '00 and from 7% in Fall '99 to 30% in Fall '00. This two-year comparison suggests that mowing of these pastures would reduce the golden rod content and increase orchard grass making them more similar to our conventional pastures.

Pastures 7 and 8 had a history of past predation by goats. The randomly assigned transects encountered some woody browse. However, most of the woody browse remaining in Pasture 7 is concentrated in the brushy wetland area surveyed below.

#### Point Intercept Survey -

The results of the point intercept survey of the brushy wetland area of Pasture 7 are shown in the two tables below. The tallest brushy plants at the sample points were predominantly red-stemmed dogwood. Honeysuckle and elderberry were also represented. The height of the brushy plants decreased from 1999 to 2000 at 6 of the 8 sample points as shown in Table 8. Losses ranged from 3 to 12 inches with the exception of one point where the plant had died. The height remained the same at one sample point and increased 2 inches at the remaining point.

Density of the vegetation at 7 of the 8 sample points decreased from 1999 to 2000 as shown in Table 9. Although 2000 was a wetter year than 1999, the certified foresters judged that the wetland had not received too much water in 2000. Their opinion was that damage from predation by the goats explained the loss in height and density of the wetland browse. This section of Pasture 7 is immediately attacked when the goats enter Pasture 7. The goats remain on this brush pasture for 30 days and completely defoliate the entire pasture. They make plenty of return trips during that time to this favorite section where they prune off tender growing points and girdle smaller stems. Antidotal evidence suggests that in the years since 2000 the browse in this wetland has further deteriorated as judged visually although it still exists. Plans in 2004 include fencing it off and providing a fenced path through it. It will be rested for a year and then gradually exposed to limited, short duration goat browsing as it recovers.

#### Chain sawed test plots -

The certified foresters visually evaluated the chain-sawed areas (composed primarily of dogwood) in August 99. It was their consensus that there were not appreciable differences in the amount of suckering or regrowth between the girdled dogwood that had been pruned back with a chainsaw compared to the control plants. The pruned sections did look more aesthetically pleasing. Black willow and

multiflora rose samples within the chain sawed areas possibly showed more suckering but there were too few plants to make a serious judgment. The chainsaw tended to jam on the thin twigs and stems of browse plants and took more time and labor to treat a small area than anticipated. Thus, the vague results probably do not warrant the effort.

- [FNE99-276 Final Report](#)

## Cooperators

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## Research

### Participation Summary

Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture or SARE.



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