

Potential for Using Goats as a Vegetation Management Tool for Enhancing Landfill Cap Stability and Reducing Maintenance Costs

William Ison UK, Animal Science Student & Terry K. Hutchens, UK

William Ison is a University of Kentucky senior majoring in Animal Sciences. William conducted the research designed the grazing scheme and constructed the business plan for the Bluegrass Depot. The Depot is located in eastern Fayette County. William Ison worked with direction from Terry Hutchens, Extension Specialist, University of Kentucky Animal & Food Sciences Dept

Goats are beneficial to the environment and can be used as reliable vegetation managers and nutrient recyclers on environmentally sensitive areas such as clay-capped landfill sites. Goats accentuates soil-plant nutrient flow and will impede the natural succession of grass land to brush, tall shrubs, trees, and other plants that have deep penetrating roots. Therefore, goats are exceptional effective with vegetation management and are particularly beneficial under more fragile grazing conditions.

The use of goats in vegetation management is new to the eastern sector of the country. However, the interest is growing rapidly, particularly the employment of goats in municipal settings with pesticides as well as labor cost for hand removal. The employment of goats in municipal areas reduces human contact with pesticides as well as labor cost for hand removal.

The Lexington Bluegrass Station, located near Lexington Kentucky ask for assistance from us, UK, Cooperative Extension Service, to assess the potential for using goats to control grass and vegetation on 51 acres of landfill. Fifty one acres of landfill is divided into three landfill sections and are comprised of segments measuring 30, 14 and 7 acres of landfill.

Requirements for Introduction of Goats to Landfill Sites

Assessing Animal Needs

Water tanks and water will be supplied to each site by the Depot while the producer will supply the goats, temporary electrical fencing for subdividing the landfills and free choice mineral and feeders. The perimeter fence is 8 ft chain link fencing and the integrity of the fence will be maintained by the Depot.

The classes of goats to consider in vegetation management are as follows: first, a commercial doe herd. The landfill grazing site will provide an opportunity for removing the herd from the farm of residence, thus allowing resident pasture rest and regrowth as well as an opportunity to reduce parasite loads residing on resident pastures.

However, in this case and in the case of most municipal situation, the grazing herd must be removed from the site at the end of the grazing season. Over-wintering of the herd on site is generally not an option.

Second, feeder kids may be purchased off farms or stockyards (weights 35-40 lbs) in the spring and goats are then sold for slaughter in the fall (weights 65-80 lbs). The inherent problem with this type of enterprise is the high risk associated with the high death loss potential of purchased weanling goats and the intense labor requirement than is initially need in order to sustain acceptable

survival rates. The D-factor often comes into play. That is, the greater the D-factor or the greater the distance from home, the lower the survival rate. Third, feeder kids require more facilities for working and treatment than do adult goats and therefore the producers would need to move working facilities, shade and shelter facilities to the grazing site. Finally, feeder kids would be purchased on the highest market of the year, the spring market. They are then sold on a lower priced market which generally is the case in late fall. The downward push of the price curve makes profit margins narrow. Higher death losses and greater input costs can negatively affect profitability of this type of enterprise.

The third and perhaps most practical choice is to purchase cull animals, both bucks and does in the spring, grazing them through the summer and sell in the fall. The price per pound of animal bought or sold varies only slightly during the year. Next, death losses are lower in older animals, labor and facility needs are small when compared to feeder kids. Therefore, in this case we are selecting the last option, the purchased cull animal option.

Grazing Strategy

The format for the grazing strategy was taken from a University of Kentucky, Extension publication, **ID 143- Rotational Grazing**. This publication will walk producers' through the steps needed for proper pasture setup of a rotational grazing system, whether the grazing species is cattle or goats.

How many pasture subdivisions do you need? This number can be determined by dividing the number of days of pasture rest (period of not grazing and allowing regrowth) by the number of days of grazing (time spent on a location actually grazing) and an additional paddock is added to the final number of paddocks (Table 1 and 2).

Tall Fescue needs 30 days of rest between grazing periods. Paddocks should be grazed intensively for a short period of time. This type of management system promotes new vegetative growth by reducing incidence of over maturation, reduces overgrazing which assures rapid regrowth, promotes deeper root systems and therefore, reduce dry weather effects and promotes an increase in overall pasture density. Improve density increases yearly utilization and improves overall carrying capacity. Increased carrying capacity increase the number of animals that can be sustained on 1 acre of pasture.

<p>Table 1 Number of Paddocks (30 Days Rest / 7 Days Grazing) = 4.2 Paddocks + 1 Paddock = 5 Paddocks (for each of the two larger lots).</p>

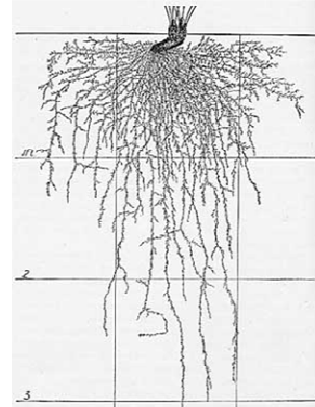
The two larger landfill sites, 30 and 14 acre sites are calculated as described below. The number of head will be changed for the smaller of the two landfill sites. The projected stocking rate will be 5 goats / acres or approximately 500 lbs of livestock per acre. This is equivalent to ½ an animal unit per acre. For the 30 acre tract, approximately, 22 acres of grazing area will be broken into 5 grazing paddocks and each paddock will be approximately 4.33 acres in area.

Goats will be rotated each 7 days. A single 7 acre area will remain as *unplanned grazing* in order to provide a sacrifice paddock to be used during dry weather condition. During weather extremes, rotation onto grazing paddocks can be slowed by 7 days by adding a 6th paddock. Thus give more recovery time for each paddock between grazing periods.

The fourteen acre landfill site will support 70 head of goats. Using the formulas in Tables 1 and 2, we need five, 2 acre paddocks. Each paddock shall be grazed for 7 days and rested for 30 days. Likewise, an additional unplanned paddock measuring 4 acres will be used as the sacrifice paddock.

Landfill three, 7 acres in area, is smaller than the others two landfill areas and will be grazed as a single paddock.

Landfill three, can be watched closely to prevent overgrazing. The stocking rate will be 35 goats / acre. In case of extreme dry periods, these goats can be move to the larger landfill sites and grazed together with the other animals.



Deeper root penetration as a result of rotational grazing

<p>Table 2 Acres required per paddock (Average Weight Animal) X (Percent Dry Matter Intake) X (Number Head) X (Days / Paddock) (DM per acre x Percent Utilization)</p>

<p>Example 1</p> $\frac{(100 \cdot .05 \cdot 150 \cdot 7)}{(2000 \cdot .60)} = 4.3 \text{ acres per paddock}$
--

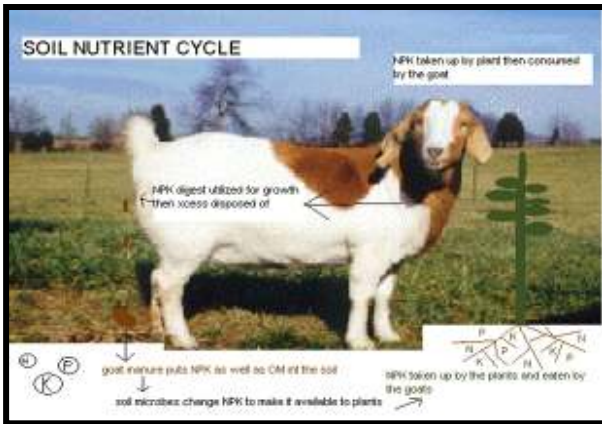
Environmental Impact Assessment

Appropriate Nutrient Management

Manure and nutrient management is an important component of any livestock related endeavor. Nutrients deposited by goats are nitrogen (N), phosphorus (P), and potassium (K). The nutrient outputs of goats are based on animal units or 1000 kilogram (kg) of animal output of waste on a per day basis. The nutrient out-put per 1000 Kg of goats is estimated to be (0.45 Kg of N), (0.11 Kg of P) and (0.31 Kg of K) all release daily.

This project has 255 goats weighting approximately 100 lbs each. Therefore 25,500 lbs of live weight is 11,590 kg. Therefore, on a 1000 kg bases there are 11.59 animal units on the 3 land fill sites. Furthermore, there are (2.2 lbs N), (0.054 lbs P), and (0.15 lbs of K) being applied per acre per day and, the nutritional needs for tall fescue are estimated to be (39.2 lbs of N), (4.2 lbs P)

and (42 lbs of K) per acre per day there is little need for concern for nutrient runoff.



	<u>Goat Production</u>	<u>Tall Fescue Uptake</u>
N=	0.2249 lbs	39.2 lbs
P=	0.054 lbs	4.2 lbs
K=	0.15 lbs	42.0 lbs

All on a dry matter (DM) basis.

Economic Considerations

Cost and Returns

We have designed a workable grazing system. And we have a high degree of assurance of not creating an environmental hazard through nutrient runoff. However, is there a profit insensitive for a potential producer who may wish to participate in vegetative management of landfills and similar municipal sites such as this?

The most significant cost for this program is livestock cost. The values seen in the yearly costs column, shown in Table 4, are based on the average cull goat cost of \$65/cwt for an average live body weight of 80 lbs. This results in a cash outlay of \$13,260/year.

Second, the goats will be grazing for 240 days with an estimated average daily gain of 0.20 lbs per day resulting in 48 lbs of gain per head. The average weight of the goats at market time in October is projected to be 128 lbs, all of which result in an estimated total gain of 32,640 lbs. The total weight is discounted by subtracting an assumed death loss of 3% or 980 lbs of live weight. Sale price estimates for slaughter cull goats in October is \$53 cwt resulting in gross returns of \$16,621 (Table 4). Net return is shown in Table 4, column 3, \$2574 after subtracting cash cost. Therefore, the projected return per acre of landfill grazed is \$50.47/acre.

Conclusion

The benefit to the landfill manager is significant. The average cost of mowing municipal sites in central Kentucky is thirty dollars / acre / mowing. The landfills are generally mowed 3 times / year. Table 5 indicates an annual savings to the Bluegrass Depot of \$4590 annually. As a result of proper grazing management, forage quality, density as well as root system will improve with time leaving the

landfill less subject to sheet erosion and therefore more resistant to woody plant and invasive species invasion of the landfill cap. Rotational grazing systems have been shown to improve nutrient distribution and simultaneously improve nutrient cycling within the soil-forage environment. All plant nutrients applied by manure dropping will be distributed through plant-soil uptake are not subject to runoff and will not serve as a source of pollution. Finally, there is an economic advantage for the goat producer and the Bluegrass Depot for forming a partnership such as the one described above.

Table 4	Cost / Year	Returns / Year
Cost Items	\$	\$
Goat Sold Net Returns		\$16,621
Goats	13,260	
Mineral	128	
Fencing	215	
Medication	383	
Transportation	255	
Total Costs	\$14,047	
Gross Returns		\$2574

Table 5.	Cost/Acre	Landfill Acres 51 Cost / Mowing	Landfill Acres 51 (3 mowing / year) Cost / Mowing / Year
Savings to the Municipality Bluegrass Depot	\$	\$	\$
Mowing Cost	\$30	\$1530	\$4590

* Mowing cost is based on local cost of mowing in Fayette Co. Kentucky

