How can we produce more manure on-farm for our bananas?

Goat manure is not commonly used on bananas. Is that because tethering and free range goats do not yield much manure?

### Zero Grazed

- Manure easy to collect;
- Animal well fed;
- Animal safe from loss;
- No tick exposure;
- Controlled breeding;

**Advantages**

- Limited fodder quality and quantity;
- Injury from rope;
- Tick and disease exposure;
- No manure collection during grazing.

**Disadvantages**

- Labor for feeding and water;
- Cost of structure;
- Ensure access to male goat;

**How many basins of manure per month?**

- Four small basins of manure per month

### Tethered goat

- No fodder planting or harvesting;
- No structure needed;
- More easy contact with male goat.

**Advantages**

- Low labour;
- Free access to fodder;
- Easy access to male goat.

**Disadvantages**

- More ticks and parasites;
- Damage to crops;
- No manure collections during the time of grazing.

**How many basins of manure per month?**

- One small basin of manure per month

### Free Range goat

**Advantages**

- No fodder planing or harvesting;
- Free access to fodder;
- Easy access to male goat.

**Disadvantages**

- More ticks and parasites;
- Damage to crops;
- No manure collection during grazing.

**How many basins of manure per month?**

- One small basin of manure per month

---

What feeds + fodders do we have on-farm for zero grazed goats?

Proper feeding and access to water are key to productive and profitable zero grazed goats. Each farm has existing feed resources and space to plant more shrubs and trees. Walk your farm and make an inventory.

**Fodder + Feeds for Energy**

- Sweet potato vires
- Banana Peels

**Fodder for Protein**

- Calliandra
- Leucaena

**Fodder for Energy & Protein**

- Vernonia
- Mullberry
- Ficus
- Mango

**Also**

- Cassava peels
- Jack Fruits
- Other crops and household waste
How much shrub fodder is needed to feed one goat?

A zero grazed goat depends on the household for daily feed—not too much/not too little

Which goat needs more feed and fodder per day? (Feed by weight)

<table>
<thead>
<tr>
<th>Goat Weight</th>
<th>Daily Fodder</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 kg goat</td>
<td>2 kg fresh fodder daily</td>
</tr>
<tr>
<td>30 kg goat</td>
<td>4 kg fresh fodder daily</td>
</tr>
<tr>
<td>45 kg goat</td>
<td>6 kg fresh fodder daily</td>
</tr>
</tbody>
</table>

Which goat needs more feed? (Feed by production level)

<table>
<thead>
<tr>
<th>Goat Type</th>
<th>Daily Fodder</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 kg dry goat</td>
<td>5 kg fresh fodder daily</td>
</tr>
<tr>
<td>40 kg late pregnancy</td>
<td>5 kg fresh fodder daily</td>
</tr>
<tr>
<td>40 kg goat with twins</td>
<td>8 kg fresh fodder daily</td>
</tr>
<tr>
<td>40 kg goat with triplets</td>
<td>10 kg fresh fodder daily</td>
</tr>
</tbody>
</table>

How do we know a goat is properly fed?

Body Condition score (2)
- This animal is thin.
- The ribs, backbone, and tail head are sharp and visible.
- Ribs are easily felt coming off the back.

Body condition score (3)
- The backbone is not prominent.
- The ribs are only barely visible, but can still be felt with a light touch.
- Loin rounded and barely visible.

Body condition score (4)
- Backbone is no longer visible as separate joints and feels almost smooth.
- Ribs fully covered.
- Loin very rounded and not visible.

Which feed & fodder provide good goat performance?

Every day an adult goat should eat at least 1 kg from each type of food and be fed with most available fodder to total fodder needed by weight and production level of goat.

<table>
<thead>
<tr>
<th>Feed Type</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy feed</td>
<td>1 kg</td>
</tr>
<tr>
<td>Protein fodder</td>
<td>1 kg</td>
</tr>
<tr>
<td>Energy &amp; protein fodder</td>
<td>1 kg</td>
</tr>
<tr>
<td>Access to water</td>
<td></td>
</tr>
</tbody>
</table>

Banana Peels | Calliandra | Ficus | Goats drinking water
**Where on farm can we plant fodder trees and shrubs?**

*Look for space on farm that does not reduce the area for crops. Frequent pruning should also ensure that neighbor crops have plenty of sun.*

**Hedges are shrubs in a line with 1 - 3 plants per meter**

- Leucaena hedge on contour in field
- Calliandra hedge on field border
- Sesbania hedge on farm boundary

**Other sites for trees and shrubs**

- Ficus shade over banana
- Mullberry and ficus shrubs under banana
- Mango and jack in courtyard

**What differences can we see between good & poor harvesting?**

**How do we harvest fodder from shrubs for greater productivity?**

*Shoots of new growth 30-50 cm provide high quality fodder. Certain practices maintain shrub vigor and lengthen the period before replanting.*

- Harvest stem by stem selectively. Do not damage tender shoots which are the next harvest.
- Remove old growth that shades out young sprouts.
- Renovate plants which become too tall or have many small sprouts by cutting back main stem at 45° angle. Ensure a clean cut with no splitting or peeling.
Goats, matooke fighting poverty in Kiboga, Nakaseke

On a thickly bushy village road, our car surely trudges on; considering the adjacent hill, one can think at the end of the bushy stretch a cave’s mouth awaits us at the hill’s foot.

Additionally, a glance ahead clearly manifests no sign of anything impressionable until the car pulls over into Frederick Kisembo’s 25 acre territory, with 23 for farm use, in Kiryamudo village, Lwamata sub-county in Kiboga district.

Clad in a blue overall, Kisembo, a farmer, is up and down not only supervising, but participating with his workers in farm activities such as feeding goats.

“Initially, I had no liking for goats until I got knowledge on how to handle and rear goats on zero grazing,” he says. Having started with an in-kid goat given to him three years ago by Bioversity International, an agriculture research-based organisation, Kisembo currently has seven crossbred goats.

“During the training in our farmers’ group, we were given the knowledge and skills on having goats in a small space and yet benefit a lot from them in terms of manure, milk production and sales. I am actually excited about them,” he states.

Kisembo, who grew the numbers to 11 goats and has sold some, especially due to his children’s school fees demands and feeding, says he has so far earned sh420,000 from goat sales. “I always sell between sh140,000 and 150,000,” he explains.

He attests that goats are the most rewarding in terms of cost-effectiveness, noting that apart from deworming, no other expenses are incurred.

Feeding the goats, Kisembo says, has been well-managed using the fodder they were encouraged to grow in their banana gardens.

“We were told to plant mulsbury, calliandra, leucena, tithonia and eight clusters, weighs between 12kg and 15kg, costing competitive in the market; a bunch has between seven and 10 clusters and rather sizeable fingers, thus costing between sh8,000 during the bumpy time and sh10,000 off season,” he explains.

Where only manure is applied, Kisembo says the yield is good for the market; a bunch weighs between 15kg and 20kg and there is a high sucker multiplication. “It has between seven and 10 clusters and rather sizeable fingers, thus costing between sh8,000 during the bumpy time and sh10,000 off season,” he explains.

He has harvested only five small bunches from the first plot, which neither has manure nor mulch. “The bunches from this plot weigh about 4kg and have between three and four clusters comprising small fingers, thus a poor price value on the market; sh3,000 during the season and sh5,000 off season,” he explains.

The bunches, he says, from the only mulched plot are not competitive in the market; a bunch has between seven and eight clusters, weighs between 12kg and 15kg, costing between sh8,000 in season and sh7,000 off season.

The plot combining manure and mulching, Kisembo says, not only has a higher sucker multiplication rate, but promising yields; 10-15 clusters comprise a bunch and weighs over 30kg, thus costing between sh13,000 during season and sh15,000 off season.

From his plantation, generally, including the four plots for banana farming, Kisembo received 40 suckers planted in four different plots, with each plot having 10 suckers.

Justine Namatovu of Nakaseke feeding some of her goats with the shrubs from her plantation

From the goat sales, Namaweje plans to build a brick house for her family

(wild sunflower), ficus (mutuba),” he recounts, adding: “These shrubs are not only rich in energy and proteins for the goats, we also use the off cuts for mulching.”

Looking at his banana plantation, the shrubs have been planted in hedges to act as contours for water and soil conservation and retention.

For demonstration of the sustainability of manure production for banana farming, Kisembo received 40 suckers planted in four different plots, with each plot having 10 suckers.

Justine Namatovu of Nakaseke feeding some of her goats with the shrubs from her plantation

From the goat sales, Namaweje plans to build a brick house for her family

Improvement of lives and food security for their families.

“After the training on the productivity of zero grazing, I see there is a big difference in terms of labour and productivity in comparison to tethering,” states Mayambala.

He regrets the 25 years spent rearing goats the traditional way, arguing that if he had invested such time in zero-grazing, a lot would have been achieved.

“I imagine for all that time I do not remember reaching even half of the number that I have with zero grazing,” observes Mayambala who currently has 17 goats and is nursing plans of hitting 50 goats for higher manure production for his banana gardens.

Additionally, he says, the project changed his decision to limit the level of his children’s education.

“I have nine children and paying school fees was a problem. We decided that our children end in S4,” he says, adding: “But, now that we have the goats we can sell, we have changed that idea; two of my children have now done senior six and are waiting to start their diploma studies and others are in secondary and primary schools.”

He sells the goats for between sh100,000 and sh150,000; this year he has sold two goats, earning sh230,000. Just like Mayambala, Kundishasha says the acquired knowledge has been helpful in light of the high banana productivity she is experiencing.

Nambiugula harvesting a bunch from the plot where she applied mulching and goat's manure

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Farming should be treated as a business

"I was trained that high yields start from the preparation stage, for instance, the size of the hole. The hole has to be big; three feet deep, four feet wide and plants have to be three metres apart," she says.

In a month, Kundishasha, who affirms that she learnt that the suckers to be planted should have no roots, harvests In a month, Kundishasha, who affirms that she learnt that harvests In a month, Kundishasha, who affirms that she learnt that.

Therefore, Wesigah explains, the three-year research project sought to find out mechanisms of maintaining and increasing manure production through use of on-farm trees, shrubs and livestock.

On the other hand, for the members of the Kasaana Smart Farmers Group in Sembabule, Matete town council, all is equally well.

"We were given Mpologoma and Kïbiïzi varieties which were initially rare here. They are doing well and a bunch costs between sh15, 000 and sh20, 000. That aside, we have transferred the skills we learnt to our children to enable them be self-reliant," she says.

Kisembo from the plantation after harvesting shrubs for his goats

At Sam Kasule’s farm in Kasaana village in Semuto sub-county, the farm manager, Emmanuel Lubega, says the goat project has led to increased manure production for the gardens and the shrubs have made zero-grazing more rewarding.

"We sell a three-month old goat for breeding at sh150, 000 and a five-month one for meat at sh100, 000. The farm has sold three goats so far and currently has 13 goats," Lubega explains.

Justine Namatovu, who has nine goats and has sold some, commends Bioversity International for the banana varieties they were given.

"We were given Mpologoma and Kïbiïzi varieties which were initially rare here. They are doing well and a bunch costs between sh15, 000 and sh20, 000. That aside, we have transferred the skills we learnt to our children to enable them be self-reliant," she says.

Namatovu calls upon farmers to appreciate working in groups considering that few can make any progress if they work individually.

"We realise the farmers had the challenge of stray animals eating and spoiling their plants. We also realised land is increasingly getting infertile and so continuously needed manure. So, we had to think of ways of turning the tide for the better," he explains.

It is in light of this that they conceived the idea of asking farmers to plant fodder hedges in their plantations to feed the animals in zero grazing, which animals will produce manure for the soil and then increase banana production.

Therefore, Wesigah explains, the three-year research project sought to find out mechanisms of maintaining and increasing banana productivity through use of on-farm trees, shrubs and livestock.

The project started in 2009 with sensitisation of selected farmers, through partner organisations such Volunteer Efforts for Development based in Nakaseke, Kïboga district local government and Vi Agro Forestry in Masaka but operating in Sembabule.

"In 2010, baseline surveys were done and the actual meetings of selecting farmers started. In 2011, the bananas and shrubs were planted and then the goats given out in 2012," he says.

Project background

Jimmy Wesigah, a researcher on the project, says the project, which is winding up, was kick-started by an earlier project in Luwero, Rukungiri and Kalangala on evaluating different banana types.

"It is this non-business approach to farming that has kept farmers poor; they should change the approach if they are to jump out of poverty," he says, advising: "They should start keeping records so that they can know how much they invest and how much they reap. Considering the size of structures in place, Ssemwogerere, who owns an eight acre banana plantation, is targeting owning 20 goats, an objective he says he will achieve if he is to meet the manure demands of his banana plantation.

"On the whole, I get about 70 bunches after every 10 days from the eight acres, selling a bunch at about sh12, 000," he says.

Kisembo pointing at one of the bunches ready for harvest from the plot where he has applied both mulching and manure
Is there space for more trees and shrubs on our farms?

Trees and shrubs can contribute fodder, mulch and construction poles and timber. Some farms and communities are rich in trees and shrubs. Others have few but could take action to have more.

How can we assess how rich our farm is in trees and shrubs?

1. Draw a map of all your fields and note down their current use, including wood lots, small forests and woody fallows.

2. For wood lots, forests and shrub fallows:
   - Estimate area, 3 - 5 most useful species and the total number of small, medium and large trees.

3. Walk all crop fields and grazing land and count small, medium and large trees.

4. Observe all trees and shrubs for available fodder, mulch and poles for construction:
   - No trees or shrubs for fodder, mulch or poles
   - Some mulch, fodder and poles
   - Abundant on farm fodder

5. After completing the steps above, mark a tick in each of the 4 areas below. This provides an assessment of the readiness of your farm for better bananas from trees and shrubs.

<table>
<thead>
<tr>
<th>Land for more bananas</th>
<th>Fodder from trees/shrubs</th>
<th>Mulch from trees/shrubs</th>
<th>Timber to build zero grazing shelter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large trees empty of crops</td>
<td>Abundant tree/shrubs with high use potential</td>
<td>Abundant tree/shrubs to provide mulch</td>
<td>Excess of timber on farm with construction value</td>
</tr>
<tr>
<td>Large trees with existing banana and/or coffee</td>
<td>Some trees/shrubs with high use potential</td>
<td>Some trees/shrubs</td>
<td>Most timber available on farm for shelter construction</td>
</tr>
<tr>
<td>Land in shrub fallow</td>
<td>Some trees/shrubs with moderate use potential</td>
<td>Few trees/shrubs</td>
<td>Some timber for shelter construction</td>
</tr>
<tr>
<td>Banana and/or coffee without trees</td>
<td>None or few trees/shrubs with low use potential</td>
<td>None or very few trees/shrubs for mulch</td>
<td>No trees/shrubs with construction value</td>
</tr>
<tr>
<td>Annual crop land continuous cropping</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
What trees and shrubs provide poles and timber to build a goat shelter with a raised floor?

A goat shelter with a raised floor simplifies manure collection and keeps manure dry for easy application to crops. A well built shelter ensures our goats are safe, comfortable and free of ticks and parasites.

What is a minimum space for a zero-grazing shelter?

2 x 3 metre for 3 adult goats with outside exercise space. Separation panel optional to isolate animals needing care.

What features simplify manure collection?

- Elevated floor with slats allow manure to pass through making manure collection easy.
- Slats too narrow or none make manure trapped and wet.

How can we ensure the goat remains cool, dry, clean and free of ticks and parasites?

- Wide roof to protect from sun and rain.
- High roof out of reach of goats.
- Good aeration in the goat structure.
- Exercise area.

What trees and shrubs should we plant to have more construction materials on farm for the future?

- Ficus for poles and fodder
- Senna for poles
- Markhamia for poles

Name three trees and shrubs to maintain and increase on your farm

1. __________________________
2. __________________________
3. __________________________
4. __________________________
How can trees and shrubs contribute to banana productivity?

Manure and swamp grass mulch have been used by farmers for many years to produce better bunches. In recent times we need to search for new sources of manure and mulch to sustain and improve our bananas.

Do bananas grow better with manure and mulch?

In Kiboga, Mateete, and Nakaseke, 73 farmers planted 4 plots each to test the effects of manure and mulch on bananas.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Bunch Weight (kg)</th>
<th>Time to First Bunch (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banana alone</td>
<td>7.8</td>
<td>345</td>
</tr>
<tr>
<td>Banana + mulch</td>
<td>13.2</td>
<td>311</td>
</tr>
<tr>
<td>Banana + manure</td>
<td>16.6</td>
<td>323</td>
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<tr>
<td>Banana + manure + mulch</td>
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How many shrubs to feed one adult goat?

250 fodder shrubs planted

3-6 kg shrub fodder per adult goat per day

50 banana plants receive one basin of manure/year

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What are sources of mulch from trees and shrubs on farm?

Overgrown and surplus fodder

Rejected fodder

Prune pre-existing trees

Where can I learn more?

From 2010 - 2014, three groups of farmers tested zero grazed goats fed with shrubs to produce manure for banana.

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