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Demonstration of Efficient Feed Conservation Techniques: Silage Making in Kafa zone

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Abstract
The study was conducted with the objective of demonstrating silage making technique under smallholder farmers' condition. It was conducted using two methods of silage making; pit and plastic bag methods. Thinning of maize at 50% flowering was the source of feed material for silage making. The material was hand chopped in to pieces and compacted through treading layer by layer after entering in to the pit and plastic bag. Silage with golden color and attractive aroma was obtained after long time sealing underground and in the plastic bag. Farmers' attitude has been changed and pit method was preferred by the participant farmers. From the study, it was concluded that with proper accomplishment of activities or procedures, silage could be made successfully and stored for longer time. Silage making with fibrous feed stuffs (crop residue), natural pasture and improved forage crops should be tried. Further study on the effect of silage on livestock productivity traits is important.
Keywords: Silage making, conservation, kafa, Ethiopia

1. lntroduction

During the wet season, tropical forage species grow very fast and, with forage yield often exceeding animal requirements. It is obvious that feeding of green and succulent fodder is of great importance to farm animals. However, the availability of green fodder is limited to a particular season only. During months of scarcity such as November, December, January and February, green fodders are not available for feeding to livestock in western regions; particularly in kafa zone. During such circumstances, use of unconventional (not commonly used for feeding of livestock) feeds is mandatory.

During summer season plenty of greens are available, but they are not properly utilized by the farmers due to lack of sufficient knowledge of fodder conservation. If not c ut and fed to animals, tropical forage species will continue to grow, change its soluble nutrients to unpalatable and long fibrous materials, and become low in feeding value. Using feed conservation is viable option under such circumstances. Storage of surplus fodder, provision of animals with good quality fodder during shortage as well as maintaining animal production and productivity during scarcity are main importance of feed conservation. Conservation techniques like silage making, hay making and others can be practiced depending on weather condition of the area at desired time to conserve. Excess high quality fodder can be preserved as silage or hay for use during dry season.

Silage is the product of controlled fermentation of green fodder retaining high moisture content or it is cut and green plant material and that is sealed in silo without air and water. The material is normally stored in pits or large/small sized plastic bag under anaerobic conditions. Naturally produced organic acids, chiefly lactic acid, preserves the fodder.

Hay making is difficult in many tropical regions because at the time when the forage is of acceptable quality for forage conservation to be worthwhile, which is normally early in the wet season, the weather is likely to be too unreliable for sun drying. Artificial and barn drying are expensive and facilities are not widely available. However, silage on the other hand can be made using fresh or, preferably, wilted material. Silage can also be made under unreliable weather condition.

As indicated in literatures, only excess forage, crop residues or by-products for which there is no other economic use can be ensiled. Quality and fermentable nutrient (carbohydrate) content of such feed sources are under question mark under conditions where there is limited access to different feed additives. On the other hand, non-leguminous fodder crops rich in soluble carbohydrates, such as maize, oats, sorghum, pearl millet, and cultivated grasses are most suitable for ensiling. Maize silage allows harvesting higher total dry matter than pasture. Even maize silage has higher substitution rate than concentrates (e.g. grain, molasses). When pasture growth rates are low compared to animal demand, maize silage intake can be lifted, increasing pasture substitution, boosting pasture cover levels and encouraging faster regrowth. Therefore, the study was conducted with the objective of demonstrating silage making technique under smallholders' condition.

2. Material and Methodology

The study was conducted in western region of SNNPRS mainly in Kaffa zone. Two districts (Adiyo and Gimbo) in the zone are target areas of the study. Two kebeles from each district based on their accessibility and five households from each kebele were selected by random sampling techniques. Both pit and plastic bag methods of silage making were applied on the backyard and home garden of forty households. Thinning of maize on

tasselling (flowering) stage was the feed source for silage making. All the farmers under question were trained about what silage is, how it can be made, fodder crops silage can be made from, whey it is being made, period it can stay and stored, and how it could be fed to animals.

2.1 Basic procedures of silage making

2.1.1 Preparing silo

Silo is a pit in a ground, and/or a plastic bag (large sized) where green fodder is burred as silage. The average size of ground pit used in this study was 0.6x0.6x0.7m which is determined mainly by available feed owned by participant farmers. Hoe was used for digging of the pit whilst the soil was removed using shovel. Surface of the pit was covered with lining plastic sheet. A plastic bag of capacity 50 kg was used to make silage. The feed material compacted in the plastic bag may not be necessarily 50 kilogram as it was difficult to tie.

2.1.2 Harvesting and chopping of feed

Maize was used as ensiling material in the study. Farmers are aware to sow maize by scattering and finally harvested at approximately 50% tasselling or flowering stage. This is the stage when maize is expected to have higher and matured nutrient ready to produce or bring seed. It was indicated in figure 1. The harvested maize has been hand chopped using large knife or machete against wooden block in to pieces of size 2-3cm before it has been entered to the pit or plastic bag. This stage consumed higher man power than others and followed by digging the pit during the study.

2.1.3 Checkup of moisture

The moisture level of harvested maize was checked through squeezing. So, the moisture content test showed only moist palm during the test; which is concluded to be exactly right moisture level to make silage. Therefore direct cut silage was made without need to wilting the fodder.

2.1.4 Filling the silo (pit and/or plastic bag in this study)

The material has been filled into the ground pit and plastic bag layer by layer and compacted after each layer is filled to the pit and plastic bag by continuous treading. This removes the air inside the silo. Both the pit and plastic bag have been filled continuously and sealed quickly. This therefore improves and speeds up the fermentation process. In bag method, after the fodder material has been compressed and/or compacted, the neck of the bag has been twisted, turned over and tied with rope as close to the material as possible and as tightly as possible.

2.2 Data collection

Data of fodder type, materials used, labor employed, fodder biomass, farmers opinion and applicability comparison between pit and plastic methods was collected and analyzed descriptively.

3. Result and discussion

3.1 Fodder type used

Literatures indicated that, tropical grasses are inherently low in soluble carbohydrates. However, non-leguminous fodder crops rich in soluble carbohydrates, such as maize, oats, sorghum, pearl millet, and cultivated grasses are most suitable for ensiling as reported by Mhere et al 2002. Accordingly, maize was used as source of green forage for ensiling in this study. Therefore, maize at 50% of flowering was used to make silage without addition of supplementary materials to enrich it with sugar.

3.2 Labor employed

Labor was needed to dig pit (prepare silo), harvest, carry and chop the forage material. In this study, silage was made in the backyard of the desired farmers and thus activities of harvesting forage (thinning of maize in this study) and carrying were accomplished by the farmers themselves. Digging of the pit and chopping were activities to which extra man power (labor) was consumed. Finally, the feed material was entered to the pit and plastic bag, compacted and sealed or twisted and tied carefully by technical assistants and farmers.

3.3 Fodder biomass

As it was discussed in the methodology, fodder biomass is one of the determinants of pit size. Average pit size mentioned in this study (0.6*0.6*0.7m) was very small, but it was not well filled in the backyards of some farmers due to challenges of unavailability of pasture meadow, missed information or absence of knowledge about silage and the resulting involuntariness of farmers to harvest (thin) maize for silage making. Average pit size and fodder biomass used at kebele level is mentioned in Table1.

As it is shown in the table, this study was conducted in two woredas of Kaffa zone and two kebeles in each woreda. A total of twenty (20) households, which means five (5) households in each kebele was included under this study. Plastic bag of the same or equal size and capacity were used in the backyard of each farmer. Even if Boka kebele recorded relatively higher (27.6kg) fodder biomass in plastic method, no significant

difference is observed both in woreda as well as kebele levels. All subject households were well informed to sow maize to silage making in small pilot. But only 7.5 % of the households sowed maize to the needed purpose. The households sow maize for ensiling all belong to one kebele (Shomba kichib) where the average pit size is larger and also heavier (85.2kg) average fodder biomass is recorded. In general there is significant difference between woredas in terms of fodder biomass and little/no gap with in woredas or between kebeles in the same woreda in pit method.

3.4 condition of the silage during opening

In both methods the top thin layer of silage was spoiled; and thus, it was discarded. Farmers were also awared to avoid feeding such spoiled silage to their animals. In other cases the silage had golden color and it had an aroma of local brewery *(tella);* which is highly attractive to animals and even human beings.

3.5 Feeding the silage to livestock

Silage can be fed as a source of roughage either on its own or with other feed sources. It can also be fed as supplementary feed. As the principle silage can be ready to feeding after three weeks (21 days), but currently it has been done in the mid of May and opened after it's stay for longer time (5-6 months). Literatures report as animals may not like its taste for the first few days and it should be mixed with 5-10kg green feed from 5-6 days. However, in this study most of farmers did not faced refusal of silage by animals and hence they fed silage to animals on its own without any incentive to accustom it with animals as indicated in Figur2. Animals fed silage freely few minutes after it has been opened, and few others mixed the silage with table salt and green feed sources to familiarize it with their animals. Attractive aroma of the silage after opening could be the main reason for its acceptance by the animals.

3.6 Farmers opinion

At the very beginning farmers had no information about silage. Even though a number of efforts were made to introduce/transfer theoretical knowledge about silage, farmer's opinion was not changed until the silage has been opened and got acceptance by the animals. After the fodder material has been opened, its color, aroma, absence of feed loss at the time of feeding (higher intake), it's storage for longer time with the original moisture and palatability, and finally its attractiveness to animals convinced participant householders in all kebeles. Besides this, after animals are familiarized with silage, they were offered with dry maize stalk and silage in order to compare their intake, and reception of silage was extremely higher than dry maize stalk. Animals of some farmers totally rejected to feed the dry in preference to silage. Neighbors of participant farmers were also interested to make silage and raised a number of questions about silage making after they have observed its recognition by animals.

3.7 applicability comparison between pit and plastic methods by farmers

Both methods of silage making were applicable and successful during the trial. Silage made by both methods has got the same level of reception by animals as well as by trial households. But it was made open to participant farmers to compare both methods of silage making on the basis of different events/criterions. Farmer's preference of silage making methods is indicated in Table2.

A total of eight criterions were used to compare silage making methods. And almost all farmers chose pit method in terms of level of spoilage, ease of compaction and sealing, amount of fodder stored once, susceptibility to rat and fire, space required to store, and flexibility of pit size with the number of animal and available fodder. In other hand it's lower labor requirement and cost (less cost of man power and relatively less material cost) needed to complete the work made plastic method of silage making appropriate than pit method. Accordingly, pit method is dominantly chosen by farmers to continue with the technology in the future.

4. Conclusion and recommendation

From the study, it is concluded that with proper accomplishment of activities or procedures, silage could be made successfully and stored for longer time. Silage making with fibrous feed stuffs (crop residue), natural pasture and improved forage crops should be tried. Further study on the effect of silage on livestock productivity traits is important.

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Table 1: Average pit size and fodder biomass in kebeles

District	Kebele	Average pit size (m)	Average fodder biomass (kg)	
			In pit	In plastic bag
Adiyo	Boka	0.6x0.7x0.7	54.75	27.6
	Shuta	0.6x0.5x0.5	59.75	24.2
Gimbo	Shomba kichib	0.7x0.8x0.7	85.2	23.72
	Kicho	0.7x0.7x0.5	72	26.4
	overall	2.6x2.7x2.4	271.7	101.92

Table 2: Comparison between methods of silage making based on different criterions

No.	**Criterions**	**Methods of silage making**	
		pit	plastic
1	Level of spoilage/mold growth	✓	
2	Cost		✓
3	Need of man power		✓
4	Ease of compaction and sealing	✓	
5	Amount of fodder stored once	✓	
6	Susceptibility to rat, fire &…..	✓	
7	Space requirement for storage	✓	
8	flexibility of pit size	✓	

✓ - shows criteria in terms of which on method is preferred

Figur-1 Stage at which maize was harvested for silage making

Fig-2 Cow of farmer feeding silage in Boka kebele