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Innovative feeding strategies: Evaluating the benefits of silage technology for dairy farmers

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Abstract

This study investigates the implementation of silage technology as a solution to fodder shortages faced by dairy farmers in Pune District, Maharashtra. Established in 1971, the Agricultural Development Trust (ADT) and its Krishi Vigyan Kendra (KVK), Baramati, identified a critical need for sustainable feeding strategies due to insufficient green fodder, particularly during the lean period from March to July. The research included participatory rural appraisals, demonstrations of various silage preparation methods (surface tank, pit, and polypropylene bag), and proximate analysis of corn silage from five locations. A comparative study evaluated the effects of silage feeding on crossbred cows in low and high milk yield groups, assessing changes in milk yield, fat content, and economic impact. Results indicated a 24% increase in milk yield and a 0.3-point rise in fat content in low milk yield groups, while high yield groups saw a 17% increase and a 0.3-point improvement in fat content. The successful adoption of silage technology not only enhances animal health and productivity but also reduces the need for animal replacement due to malnutrition, fostering greater economic viability in dairy farming. This study highlights the importance of innovative feeding strategies in promoting sustainable dairy production and improving farmers' livelihoods.

Keywords: Silage technology, proximate analysis, animal nutrition, milk yield, economic sustainability

Introduction

Agricultural Development Trust's (ADT) was established in 1971 with the aim of dedicated service for Indian farming community. Later on in 1992 Krishi Vigyan Kendra (KVK), Baramati was established under ADT. Krishi Vigyan Kendra (KVK), Baramati a nationally and internationally recognized farm science center renowned for its innovative contribution to the agriculture.

Dairy farming is a crucial income-generating activity in both the rain-fed and irrigated areas of Pune District, Maharashtra. Farmers primarily cultivate maize and sorghum as fodder crops. With 50% of the cattle population comprising crossbred animals, a consistent supply of green fodder is essential for optimal milk production. However, only 5% of the district's total land area is allocated for fodder crops and low annual rain fall (400-450mm), rain fed situation resulting in significant shortages, particularly from March to July in rain fed area of Pune districts. From November to March, farmers can utilize sugarcane tops, a byproduct from local sugar factories. However, relying on sugarcane tops and sugarcane for summer feeding has led to malnutrition and decreased productivity in crossbred animals. This has contributed to repeat breeding problems, forcing farmers to replace their animals every 3-4 years due to poor body condition scores, leading to considerable economic losses.

In years with annual rainfall below 400 mm, farmers often have to send their animals to camps due to the lack of green fodder or purchase sugarcane tops from irrigated areas. Recognizing these challenges, KVK Baramati has identified the urgent need for silage technology in Pune District. Implementing silage technology can provide a sustainable and nutritious fodder solution, helping to maintain animal health and productivity throughout the year. This approach will mitigate the negative effects of fodder shortages and enhance the economic viability of dairy farming in the region. Even though, there is need of determination proximate analysis and biochemical test of silage and comparative study the effect of silage feeding to crossbred cows

in low as well as high milk yield groups. Hence, present investigation a study was conducted to study these aspects

Materials and Methods

ADT's KVK, Baramati, collected data from rural communities in Pune district through Participatory Rural Appraisal (PRA) and identified a shortage of forage for animal feeding from March to July (Chambers, R. 1994) [3]. KVK recognized importance of silage technology to address this forage scarcity.

In present investigation different type demonstrations of silage preparation from corn crop (i.e. Surface tank method, Pit method and Poly propylene bag method) were planned on selected farmers' fields at five locations. Proximate analysis and biochemical test of this corn silage sample were tested from 5 locations and mean is worked out.

Simultaneously, a comparative study of effect of silage feeding to crossbred cows in low as well as high milk yield groups of selected farmers were conducted on following aspects: [Jenchieh *et al.* (2022), Koch and Lascano, (2018) and Kung (2000)] [4, 5, 6].

1. Milk yield liter per day before and after silage feeding
2. Percent of Fat in milk before and after silage feeding
3. Average / Milk lit/ day /cows

Results and Discussion

After identification silage technology in view of availability of fodder during lean period KVK has given trainings and demonstrations to the farmers from Baramati, Daund, Indapur, Purandar, Velha & Bhore Tehsils of Pune District (Fig No.1 & 2).



Fig 1: Method Demonstration on silage Making



Fig 2: Method Demonstration on silage Making

Based on the training provided, many farmers adopted silage technology. For the present investigation, KVK conducted an analysis of 10 randomly selected farmers from each of five locations and calculated the mean values (Table No. 1). The analysis revealed that the quality of silage was very good, and the animals responded positively to it; the aroma was pleasant, and the palatability was high. Silage was mixed with dry fodder, which resulted in improved dry fodder intake due to this combination. It was found that due to exact similar milk composition can be achieved during lean period when fodder availability is very low. With this technology farmers can successfully sustain their animal health along with sustainable income throughout the year.

Table 1: Proximate Analysis and Biochemical test of corn silage Sample Tested (from 5 locations)

Sr. No.	Mean	Normal Range
PH	4.7	4.5-5.5
Moisture	66.20%	65-70
CP	7.58%	07- 8
CF	22.5%	16-31%
Ether Extract	0.54%	0.50%
Total Ash	2.98%	2-3
Ca	0.51%	0.4-0.5
Phosphors	0.42%	0.30-0.40
Lactic acid	3.89%	more than 3
Acetic acid	1.24%	more than 1
Propionic acid	0.06%	0.06-0.07
Butyric acid	0.20%	less than 0.22

Data on milk yield, fat content, and solid-not-fat (SNF) levels were collected after implementing silage feeding during the summer season, specifically for crossbred HF cows in the low and high milk yield groups (Table No. 1 & 2). Teshome G and Mengistu A. (2017) [9] and Thomas *et al.* (2001) [10].

In low milk yield crossbred cow groups (Table No. 1) four farmers who has kept the proper record were selected which has total 19 milking Crossbred Cows and data was collected before and after silage feeding. In result it was found that average increase in milk yield by 1.5 lit. per day per cow (Increase in milk yield by 24%) and fat content in milk was increased by 0.3 points. Extra Income per day per animal is Rs. 52.50/-.

Table 2: Results of Silage Feeding to Crossbred Cows in low milk yield group.

Sr.	No. of the Farmer	No. of cows in milking	Milk yield lit /day		% Fat in milk	
			Before	After	Before	After
1	A	4	36	42	3.6	3.8
2	B	7	51	60	3.4	3.6
3	C	2	08	13	3.3	3.5
4	D	6	39	50	3.4	3.8
	Total	19	134	165		
	Average / Milk lit/ day /cows	4 Cows	7.05	8.68	3.38	3.64

In the case of high milk yield crossbred cow groups (Table No. 1), five farmers who maintained proper records were selected, totaling 21 milking crossbred cows. Data was collected before and after the introduction of silage feeding. The findings revealed an average increase in milk yield of 2.23 liters per day per cow, representing a 17% increase in overall milk production. Additionally, fat content in the milk increased by 0.3 points, equating to a 6% rise. This improvement resulted in an extra income of Rs. 55.75 per day per animal.

Table 3: Results of Silage Feeding to Crossbred Cows in high milk yield Group

Sr. No.	Name of the farmer	No. of cows in milking	Milk yield lit /day		Fat%	
			Before	After	Before	After
1	E	4	80	90	3.4	3.6
2	F	2	36	42	3.3	3.5
3	G	1	20	25	3.4	3.8
4	H	4	44	50	3.6	3.8
5	I	10	135	155	3.2	3.5
	Total	21	315	362	16.9	18.2
	Average Milk lit/ fat%		15	17.23	3.38	3.64

The analysis indicates that silage technology has the potential to sustain dairy animals during periods of fodder unavailability without compromising nutrient availability or milk quality. The results also show that milk yield in rain-fed villages increased by 22%. It can be concluded that by adopting this technology, farmers in rain-fed areas no longer need to replace their milking cows due to malnutrition. [Manpreet *et al.* (2022), Bilal *et al.* (2021), Waziri & Uliwa (2020), Maw Ni Soe Htet *et al.*, (2016) and Ballard (2001)]^[7, 2, 11, 8, 1].

Conclusion

The implementation of silage technology has proven to be a transformative approach for dairy farmers in Pune District, particularly in addressing the challenges of fodder scarcity during lean periods. The findings from this investigation indicate that silage feeding significantly enhances both milk yield and milk quality among crossbred cows.

In low milk yield groups, there was an impressive average increase of 24% in milk production, along with a notable rise in fat content. Similarly, high milk yield groups also benefited from silage, achieving a 17% increase in milk yield and a 6% improvement in fat content. This not only boosts the economic viability of dairy farming but also reduces the need for farmers to replace their animals due to malnutrition, a common issue in rain-fed areas.

Furthermore, the proximate analysis and biochemical tests of corn silage demonstrated its high quality and suitability as a nutritious fodder alternative. By enhancing dry fodder intake through the incorporation of silage, farmers can maintain the health and productivity of their animals throughout the year.

Overall, the successful adoption of silage technology represents a sustainable solution that can help dairy farmers mitigate the adverse effects of fodder shortages, leading to improved animal welfare, increased income, and greater resilience in dairy production systems. This study underscores the importance of innovative feeding strategies in fostering a more sustainable and profitable dairy farming sector.

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