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Evaluation of green fodder wastage and labour efficiency using improved feeders in stall-fed goats

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Abstract

Efficient feeder design plays a crucial role in minimizing feed wastage and improving labour utilization in stall-fed goat production systems. The present study was conducted to evaluate green fodder wastage and labour efficiency using improved feeders in Rohilkhandi goats. A total of 18 goats (14–15 months; 9–15 kg body weight) were randomly divided into three groups: control (existing linear feeder), portable feeder and stationary feeder, with six animals in each group. The experiment was carried out for two months, during which unchopped green fodder was offered *ad libitum* and feed intake, wastage, and labour requirement were recorded. The overall mean green fodder wastage was significantly ($P < 0.05$) higher in the control group (3.57 ± 0.18 kg) compared to the portable (2.79 ± 0.14 kg) and stationary (2.72 ± 0.14 kg) feeder groups. Similarly, labour requirement was highest in the control (141.67 ± 5.15 men seconds), followed by the portable (131.00 ± 4.06 men seconds), and lowest in the stationary feeder group (111.67 ± 5.41 men seconds). The improved feeders reduced wastage by minimizing feed spillage and contamination through structural modifications such as partitions, neck rails, and elevated feeding design. The findings indicate that improved feeder designs, particularly stationary feeders, significantly enhance feeding efficiency by reducing fodder losses and labour requirement. Adoption of such feeders can improve resource utilization and productivity in stall-fed goat farming systems.

Keywords: Rohilkhandi goats, feed wastage, labour requirement, linear feeder

1. Introduction

Feed presentation is often overlooked as a factor influencing feed intake and utilisation in goat feeding. However, the quantity of feed consumed as well as the amount wasted are crucial determinants in efficient goat feeding systems. Unlike sheep, which primarily graze, goats exhibit a natural preference for browsing behaviour. Therefore, providing feed in an elevated position that mimics a browsing environment can stimulate intake. This approach not only enhances feeding behaviour but also helps in reducing feed wastage and maintaining better feeder hygiene. Feed wastage is defined as the proportion of feed lost relative to the total quantity offered, expressed as a percentage. It serves as an important indicator of feeding efficiency in livestock systems. Efficient utilization of feed resources is a critical determinant of productivity and profitability in stall-fed goat production systems. Among the various factors influencing feeding efficiency, the method of feed presentation and feeder design play a vital yet often underemphasized role. Goats exhibit a natural browsing behaviour, preferring elevated feeding positions, which can significantly influence feed intake and wastage. Kumari *et al.* (2016) ^[1] reported that although chopping of fodder did not significantly enhance body weight gain, it contributed to reduced feed wastage. Similarly, PokSamkol (2003) ^[2] observed higher dry matter intake when foliage of *Muntingia calabura* was offered in a suspended form rather than as detached leaves, highlighting the importance of feeding method. Feeder design has been widely recognized

as a major factor affecting feed losses. Upreti *et al.* (2005) ^[3] demonstrated that concentrate wastage was considerably lower in rectangular feeders (0.61%) compared to hexagonal feeders (2.53%). In addition, green forage wastage (stylo) was markedly reduced in rectangular feeders (7.74%) relative to hexagonal designs (20.49%). The same study further indicated lower losses of straw (10.49%), Napier grass (13.86%), and total fodder (6.61%) in rectangular feeders. Mishra *et al.* (1992) ^[4] reported lower straw wastage (8.84%) in rectangular feeders compared to some recent observations. Furthermore, Kumari *et al.* (2015) ^[5] highlighted that feeder configuration also affects wastage, with circular feeders showing higher losses (4.49 ± 0.04) than linear (4.25 ± 0.04) and modified linear feeders (3.49 ± 0.08). Despite these findings, limited research has been conducted on the combined evaluation of feeder design in terms of both green fodder wastage and labour efficiency under stall-fed conditions. Therefore, the present study was undertaken to evaluate the performance of newly developed feeders in reducing green fodder wastage and labour requirement in stall-fed goats.

Methodology

The study was conducted at the Sheep and Goat Farm, Livestock Production and Management Section, ICAR–Indian Veterinary Research Institute, Izatnagar, Uttar Pradesh, India ($28^{\circ}22' \text{ N}$, $79^{\circ}24' \text{ E}$; 169.2 m above mean sea level). The experiment was carried out for two months (April–June 2023) under prevailing climatic conditions

(5°C–45°C; annual rainfall 90–120 cm). A total of 18 Rohilkhandi goats (14–15 months; 9–15 kg body weight) were randomly divided into three groups of six animals each. Three feeders were used: an existing linear feeder (control) made of angle iron and mesh, and two improved feeders (portable and stationary) fabricated using locally available materials. Both improved feeders were designed with partitions for individual feeding, a neck rail to prevent entry and contamination, and a raised platform to simulate natural browsing behaviour. Their dimensions were kept similar to the control. Group I (Control) animals were fed unchopped green fodder in the existing feeder, Group II (Portable) in the portable feeder, and Group III (Stationary) in the stationary feeder. Green fodder was offered *ad libitum* twice daily, while concentrate and dry fodder were provided uniformly. Feed intake was determined by recording the quantity offered and refused and feed wastage was calculated accordingly. Data on feed intake, wastage (kg and%) and labour requirement were recorded and analysed using ANOVA in IBM SPSS (Version 26). Treatment means were compared using Duncan's Multiple Range Test at a 5% level of significance.

Results and Discussion

The weekly total green fodder wastage (GFW) varied significantly among the treatment groups throughout the experimental period. During the first week, the mean GFW recorded in Group I (Control), Group II (Portable), and Group III (Stationary) was 2.09 ± 0.12 , 1.55 ± 0.08 , and 1.50 ± 0.14 kg, respectively. The control group exhibited significantly ($P < 0.05$) higher wastage compared to both improved feeder groups. This trend remained consistent up to the eighth week of the study. However, during the ninth week, GFW values were 3.27 ± 0.22 , 4.49 ± 0.23 , and 3.91 ± 0.25 kg for Groups I, II, and III, respectively, wherein Group II showed a significantly ($P < 0.05$) higher value than Group I without any clearly attributable cause. The overall mean GFW differed significantly ($P < 0.05$) among treatments, with values of 3.57 ± 0.18 kg (Control), 2.79 ± 0.14 kg (Portable), and 2.72 ± 0.14 kg (Stationary). The highest wastage was observed in the control group, followed

by the portable feeder, while the stationary feeder recorded the lowest losses. These findings clearly indicate that both improved feeder designs were effective in minimizing green fodder wastage under stall-fed conditions. The observed differences can be attributed to structural variations in feeder design. The portable feeder, equipped with fine iron mesh, restricted the spillage of fodder onto the ground. In contrast, the stationary feeder, constructed with brick and mortar, showed comparatively lower wastage, although some losses occurred due to goats pulling fodder stems outward. The control feeder, characterized by wider gaps between iron bars, allowed animals to pull out entire fodder stems, leading to trampling and higher wastage. This behaviour is consistent with the natural feeding habit of goats, which tend to selectively consume leaves by pulling on unchopped fodder. Feed contamination also influenced wastage patterns. As reported by Preston and Leng (1987)^[6], odour from faeces and urine can adversely affect feed intake, leading to rejection even without ingestion. In the present study, the presence of neck rails in the improved feeders prevented animals from entering the feeding area, thereby reducing contamination. Conversely, the absence of such provision in the control feeder permitted animal entry, increasing feed contamination and residual wastage. Labour requirement for feeding and cleaning operations also varied significantly among treatments. The overall mean labour time was highest in Group I (Control; 141.67 ± 5.15 men seconds), followed by Group II (Portable; 131.00 ± 4.06 men seconds) and lowest in Group III (Stationary; 111.67 ± 5.41 men seconds). The labour requirement in the stationary feeder group was significantly ($P < 0.05$) lower than the other groups. Reduced labour demand in the improved feeders, particularly the stationary type, can be attributed to minimized feed spillage and reduced accumulation of waste in the pen. In contrast, the control feeder required more time for cleaning due to greater fodder wastage resulting from its wider bar spacing. Overall, the findings demonstrate that improved feeder designs, especially stationary feeders, enhance feeding efficiency by reducing both green fodder wastage and labour requirement in stall-fed goats.

Table 1: Mean total green fodder wastage (kg) by the goats in different feeders at weekly interval (fresh basis)

Week	Control	Portable	Stationary
I	2.09 ± 0.12^{bA}	1.55 ± 0.08^{aA}	1.50 ± 0.14^{aA}
II	2.22 ± 0.14^{bA}	1.83 ± 0.09^{abAB}	1.76 ± 0.17^{aAB}
III	2.80 ± 0.19^{bAB}	2.14 ± 0.12^{aBC}	2.23 ± 0.20^{aBC}
IV	3.36 ± 0.21^{bBC}	2.52 ± 0.14^{aCD}	2.55 ± 0.21^{aBC}
V	3.63 ± 0.23^{bCD}	2.34 ± 0.13^{aCD}	2.38 ± 0.20^{aCD}
VI	4.07 ± 0.29^{bCD}	2.74 ± 0.16^{aDE}	2.75 ± 0.24^{aCD}
VII	4.75 ± 0.34^{bDE}	3.16 ± 0.17^{aE}	3.16 ± 0.27^{aD}
VIII	5.97 ± 0.41^{bE}	4.35 ± 0.23^{aF}	4.27 ± 0.32^{aE}
IX	3.27 ± 0.22^{aF}	4.49 ± 0.23^{bF}	3.91 ± 0.25^{bE}
Overall	3.57 ± 0.18^b	2.79 ± 0.14^a	2.72 ± 0.14^a
Total GFW/goat	32.13	25.20	24.57
Total GFW	192.78	151.20	147.42
GFW	22.57%	15.38%	18.66%

Values having different superscripts a, b and A, B, C, D, E, F varies significantly ($P < 0.05$) between columns and rows, respectively.

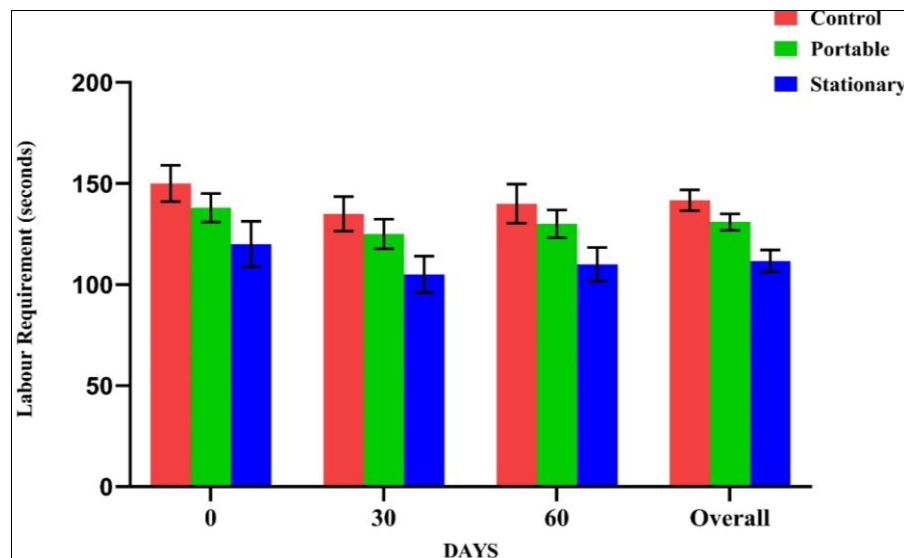


Fig 1: Mean labour requirement (man secs) of goats in different feeders at monthly interval

Conclusion and way forward

The present study clearly demonstrated that feeder design significantly influences green fodder wastage and labour efficiency in stall-fed goats. Both improved feeders (portable and stationary) resulted in significantly lower fodder wastage compared to the conventional linear feeder, with the stationary feeder showing the best performance. The reduction in wastage can be attributed to structural modifications such as provision of partitions, neck rails, and appropriate feeder height, which minimized feed spillage and contamination. In addition, labour requirement for feeding and cleaning operations was significantly reduced in the improved feeder groups, particularly in the stationary feeder, due to lower feed wastage and reduced accumulation of residues in the pen. Overall, the findings indicate that adoption of improved feeder designs enhances feeding efficiency, reduces resource losses and improves labour utilization in stall-fed goat production systems. Further research should be undertaken using larger herd sizes and across diverse agro-climatic conditions to validate the present findings under varied field situations. In addition, detailed economic evaluation of improved feeder adoption is necessary to determine cost-benefit ratios and assess farmer acceptability. Incorporation of ergonomic and behaviour-based design features may further enhance feeding efficiency as well as animal welfare. Future studies should also evaluate feeder performance with different types of fodder, including chopped and unchopped materials as well as tree leaves and grasses. Emphasis should be given to the development of low-cost, farmer-friendly feeder models for wider field-level adoption. Moreover, long-term investigations are required to assess the impact of improved feeder designs on growth performance, health status, and overall productivity of goats.

References

1. Kumari A, Patel BHM, Maurya V, Godara AS, Verma MR, Singh M. Behavioral pattern of Rohilkhandi kids under different feeding systems. *Vet World*. 2016;9(7):773.
2. PokSamkol. Effect of method of offering *Muntingia* (*Muntingia calabura*) foliages to goats on intake and

eating and ruminating time. Mekam: MSc; 2003.

3. Upreti CR, Kuwar BS, Panday SB. Development and evaluation of improved feeders for goats suitable to stall-fed management system. *Nepal Agric Res J*. 2005;6:78-83.
4. Mishra RP, Saini D, Singh K. Development of rectangular feeders for goats. In: *Proceedings of the Vth International Conference on Goats*. New Delhi: ICR & IGA; 1992. p. 381-385.
5. Kumari A, Patel BHM. Wastage of green fodder under different feeding systems in Rohilkhandi kids. 2015.
6. Preston TR, Leng RA. Matching ruminant production systems with available resources in the tropics and sub-tropics. Penambul Books; 1987.