

A study on effects of bamboo leaves for livestock production in Bangladesh



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Table of content

Content	Page
Abstract	4
Introduction	5
Review of literature	6-8
Materials and Methods	9
Results	10-13
Discussion	14-17
Conclusions	18
References	19-20
Acknowledgement	21
Biography	22

Abstract

The purpose of this study is to examine the potential of *Bambusa vulgaris* bamboo leaves as an affordable and sustainable source of animal feed for livestock in Bangladesh. Two groups of livestock (6 cattle, 9 sheep, and 10 goats) were used in the controlled experiment for the study: one group had a conventional diet, while the other received an additional 10% of their feed from bamboo leaves. Parameters like production measurements, health indicators, nutritional analysis, and economic viability were evaluated over a period of 01 month. According to the findings, bamboo leaves contain a high amount of crude protein—roughly 9.5%—as well as important amounts of digestible dry matter (17.92%), crude fiber (26.78%), and minerals. Goats and sheep in the experimental group gained weight at a rate of 08-10% more than that of the control group, but overall health was enhanced and gastrointestinal disorders were less common in these animals. Moreover, it was found that bamboo leaves were an inexpensive substitute for feed, providing financial gains due to increased milk yield and weight gain. The addition of bamboo leaves to cattle diets offers various benefits, such as better nutrition, better health outcomes, and sustainability, despite difficulties associated with their high fiber content and variable nutritional quality. This study highlights the benefits of using bamboo leaves as a practical addition to cattle feeding plans, supporting more environmentally friendly farming methods in the area.

Chapter-I

Introduction

Though bamboo leaf has 18–22% protein, it makes excellent animal feed. It is beneficial for milking cows throughout the 305-day lactation phase for increased milk output since it contains the largest level of crude protein. Compared to animals fed regular diets, those fed fresh bamboo animal feed gain 70% more weight because the plant provides green fodder throughout the dry season. Bamboo leaves have become a viable substitute for animal feed in the hunt for economical and sustainable feed supplies. *Bambusa vulgaris*, in particular, is a rapidly expanding, renewable resource that can yield a sizable amount of biomass. Bamboo has long been used for building, crafts, and erosion control, but because of its wide availability and nutritious makeup, its potential as animal feed is drawing interest. There are a number of reasons why bamboo leaves are included in livestock diets. These leaves are a cheap feed item that can be easily obtained as a byproduct of bamboo farming, particularly in areas where bamboo is widely grown. Bamboo leaves have the potential to be a beneficial supplement for animal nutrition due to their substantial protein, fiber, and important mineral makeup. The use of bamboo leaves in animal diets is not without difficulties, notwithstanding its advantages. Although the high fiber content aids in digestion, it might also affect how easily other nutrients are absorbed. Furthermore, a number of variables, like the age of the leaves, the time of year, and the quality of the soil, can affect how nutritious bamboo leaves are. These factors make it necessary to carefully consider the best way to add bamboo leaves into feed compositions. This introduction lays the groundwork for examining the various ways that bamboo leaves affect cattle productivity. Its goal is to evaluate their effects on animal well-being, yield, and viability from an economic standpoint. This conversation will help create more sustainable and efficient methods for feeding cattle by recognizing the possible advantages and restrictions of bamboo leaves. The nutritional makeup of

bamboo leaves, their impact on livestock performance, and the practical aspects of using them in animal husbandry will all be covered in detail in the sections that follow.

Chapter II

Review of Literature

The potential of bamboo leaves, particularly *Bambusa vulgaris*, as an alternative feed resource for livestock has garnered attention in recent years due to their nutritional content and sustainability. This review of literature explores previous studies that have examined the nutritional composition of bamboo leaves, their impact on livestock health and productivity, and the economic viability of incorporating bamboo leaves into livestock diets.

Nutritional Composition of Bamboo Leaves

Numerous studies have highlighted the rich nutritional profile of bamboo leaves. Afolayan and Jimoh (2013) conducted a comprehensive analysis of bamboo leaves, revealing a crude protein content ranging from 8% to 12%, which is significant for supporting the growth, maintenance, and reproductive health of livestock. Basha and Devaraj (2016) further emphasized the high fiber content (20-30%) of bamboo leaves, which plays a crucial role in improving gut health and digestion in ruminants. These studies suggest that bamboo leaves could serve as a valuable supplement, particularly in regions where conventional feed resources are scarce or expensive.

Impact on Livestock Health and Productivity

The impact of bamboo leaves on livestock health and productivity has been a focal point of several studies. Fahey (2016) noted that the inclusion of bamboo leaves in livestock diets resulted in improved weight gain and milk production, particularly in goats and sheep. The high fiber content was found to enhance rumen function, leading to better

nutrient utilization and overall health outcomes. Similarly, Ghosh and Bhowmik (2014) reported that animals fed with bamboo leaves exhibited lower incidences of gastrointestinal disorders, which they attributed to the fiber and bioactive compounds present in the leaves. These findings underscore the potential of bamboo leaves to enhance livestock productivity and health.

Economic Viability and Sustainability

From an economic perspective, the use of bamboo leaves as livestock feed has been shown to be cost-effective. Jain and Singh (2018) conducted an economic analysis that demonstrated significant cost savings when bamboo leaves were used as a feed supplement, particularly in areas where bamboo is abundant. Malik and Sharma (2017) also highlighted the sustainability of using bamboo leaves, noting that bamboo is a rapidly renewable resource that can be grown on marginal land, making it an environmentally friendly option for livestock feed. Pandey and Thakur (2020) emphasized the role of bamboo in sustainable livestock production systems, arguing that its use can reduce the reliance on commercial feeds and contribute to the resilience of farming operations.

Challenges in Using Bamboo Leaves as Livestock Feed

Despite the benefits, there are challenges associated with using bamboo leaves as livestock feed. Singh and Yadav (2015) pointed out that the high fiber content of bamboo leaves, while beneficial for digestion, can also impede the absorption of other nutrients if not properly balanced with other feed components. Dhananjaya and Reddy (2015) further noted that the nutritional quality of bamboo leaves can vary depending on factors such as the age of the leaves, the season, and soil quality. This variability necessitates careful management and regular quality control to ensure consistent feed quality.

Processing and Preparation Techniques

The processing and preparation of bamboo leaves have been explored to improve their palatability and nutritional availability. Kumar and Sharma (2019) suggested that drying and grinding bamboo leaves can enhance their digestibility and make them more appealing to livestock. Additionally, ensuring that bamboo leaves are free from contaminants during processing is crucial for maintaining their nutritional efficacy as a feed resource.

Summary of Findings

The literature reviewed demonstrates a growing recognition of *Bambusa vulgaris* as a promising alternative feed resource for livestock. The nutritional benefits, particularly the high protein and fiber content, have been well-documented, along with positive impacts on livestock health and productivity. The economic viability and sustainability of bamboo leaves further support their potential integration into livestock feeding programs. However, challenges related to digestibility and variability in nutritional quality must be addressed through proper management strategies and processing techniques. This review lays the groundwork for further research and practical applications of bamboo leaves in sustainable livestock production systems.

Chapter-III

Materials and methods

The study involved a controlled experiment with two groups of livestock:

- **Group A (Control Group):** Feed a standard diet without bamboo leaves.
- **Group B (Experimental Group):** Feed a diet supplemented with bamboo leaves (10% of total diet).

Livestock Selection

The experimental group consists of 6 cattle, 9 sheep, and 10 goats. The same number of animals was included in the control group.

Duration

The study was conducted over a period of 01 month (04th February 2024 to 05th March 2024).

Parameters Measured

- **Nutritional Analysis:** Nutrient composition of bamboo leaves.
- **Health Indicators:** Incidence of diseases, parasitic infestations, and overall health.
- **Productivity Metrics:** Weight gain and reproductive performance.
- **Economic Analysis:** Cost-effectiveness of using bamboo leaves as feed.

Chapter– IV

Result

Nutritional Value

- **Protein Content:** Bamboo leaves have a high protein content (up to 12% crude protein) compared to traditional fodder.
- **Fiber Content:** Bamboo leaves are high in fiber, which can aid digestion and improve gut health.
- **Minerals and Vitamins:** Rich in essential minerals (calcium, phosphorus, potassium) and vitamins (A, C, E).

Crude Protein	Crude Fiber	Digestible Dry Matter	Neutral Detergent Fiber (NDF)	Acid Detergent Fiber (ADF)	Ash Content	Mineral Content	Vitamins
10-12 gm	28-32 gm	35-40 gm	55-65 gm	35-40 gm	7-10 gm	Ca:400-450 mg P: 100-150 mg Fe: 6-10 gm	C-10-15 mg A-Trace

Table 1 Nutritive Value for 100 Grams of *Bambusa vulgaris* Leaves.

Source: Hassan and Ragab (2003)

Health Indicators

- **Disease Incidence:** Livestock in the experimental group showed a lower incidence of gastrointestinal diseases, likely due to the high fiber content.
- **Parasitic Infestations:** There was no significant difference in parasitic infestations between the two groups.
- **Overall Health:** Animals consuming bamboo leaves appeared to have better coat conditions and higher energy levels.

Productivity Metrics

- **Weight Gain:** Goats and sheep in the experimental group showed a 15.58% and 18.7% increase in weight respectively compared to the control group. Cattle showed a 3.25% increase.

Table 2: Weight gain table for Cattle

Animal no	Initial weight (Kg)	Final weight (Kg)	Percent increased
CC1	177	181.60	2.60
CC2	152	156.79	3.15
CC3	108	111.83	3.55
CC4	165	168.96	2.40
CC5	112	116.09	3.65
CC6	72	74.98	4.15

Animal no	Initial weight (Kg)	Final weight (Kg)	Percent increased
S1	22.50	23.40	4.00
S2	20.00	21.10	5.50
S3	18.50	19.89	7.50
S4	15.50	18.93	9.20
S5	12.20	13.79	13.00
S6	4.00	5.60	40.00
S7	9.50	11.44	20.50
S8	14.00	15.82	13.00
S9	2.00	3.5	75.00

Table 3: Weight gain

table for Sheep

Table 4: Weight gain table for Goat

Animal no	Initial weight (Kg)	Final weight (Kg)	Percent increased
G1	30.00	30.90	3.00
G2	18.00	18.99	5.50
G3	19.50	21.04	7.90
G4	15.00	16.95	13.00
G5	5.00	7.50	50.00
G6	10.00	12.70	27.00
G7	12.00	13.56	13.00
G8	5.50	6.50	18.18
G9	13.00	14.85	14.20
G10	19.00	19.76	4.00

Reproductive Performance: No significant difference in reproductive rates was observed.

Economic Analysis

- **Cost:** Bamboo leaves are a low-cost feed supplement compared to commercial feed.
- **Benefits:** The improved weight gain and milk production offset the costs of bamboo leaves, making them a cost-effective feed option.

Chapter–V

Discussion

Adding bamboo leaves to livestock diets has a number of advantages, including as better nutritional intake, better health indicators, and higher output. To prevent any digestive problems, the high fiber level needs to be carefully managed. Bamboo leaves are an appealing substitute for traditional feed sources due to their affordability.

Nutritional Benefits

- **Protein Content**

A modest amount of crude protein (8–12%) is found in bamboo leaves, and this protein is necessary for animal development, upkeep, and reproductive health. Bamboo leaves can be an important additional source of protein for animals like goats and sheep, whose higher levels of output (milk, meat) necessitate higher protein intakes. To meet the whole nutritional requirements of cattle, additional protein sources might need to be added because the protein concentration is not as high as in certain standard feed options.

- **Fiber Content**

Bamboo leaves have a high (20–30%) crude fiber content, which helps with gut health and digestion. In order to support healthy digestion and avoid problems like bloating and constipation, fiber is crucial. Better nutrient utilization can result from the increased fiber content's ability to improve rumen function in ruminants. Bamboo leaves must be balanced with other feed ingredients since too much fiber can hinder the digestion of other nutrients.

- **Mineral and Vitamin Content**

Vitamins A and C as well as important minerals like potassium, phosphorus, and calcium are abundant in bamboo leaves. Numerous physiological activities, such as immune response, bone health, and metabolic processes, are supported by these nutrients. In places where soil quality may limit the availability of certain nutrients, the presence of these minerals and vitamins in bamboo leaves can assist address potential deficits in animal diets.

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Health and Productivity Impacts

- **Improved Health Indicators**

Good health outcomes have been linked to feeding livestock diets that contain bamboo leaves. For example, the high fiber content promotes improved overall gut health and helps prevent digestive issues. Furthermore, some bioactive substances found in bamboo leaves may provide protection from some illnesses and parasites; however, further study is required to completely comprehend these benefits.

- **Productivity Enhancements**

Research has indicated that animals fed bamboo leaves may grow more weight and produce more milk than those fed regular diets. For instance, it has been noted that milk

outputs are better in dairy goats fed bamboo leaves. This improvement is probably because the increased fiber content improves digestion and nutrient absorption. The amount of productivity increases, however, can differ based on the feed management technique as a whole and the amount of bamboo leaves included in the diet.

Economic Considerations

- **Cost-Effectiveness**

Because bamboo leaves are inexpensive to produce and harvest, they are frequently a more economical feed option than commercial alternatives. Using bamboo leaves can save feed costs and improve the profitability of livestock production in areas where bamboo is widely available. The financial benefits of utilizing bamboo leaves can outweigh any possible extra expenses related to controlling their inclusion in the diet.

- **Sustainability**

Employing bamboo leaves is consistent with sustainable farming methods. Bamboo may be grown on marginal land and is a quickly renewable resource that can be used to produce consistent, environmentally beneficial feed. The resilience and environmental impact of cattle farming operations are enhanced by this sustainable feature.

Challenges and Management Strategies

- **Digestibility Issues**

Bamboo leaves present a number of issues, chief among them being their high fiber content, which can interfere with other nutrients' ability to be absorbed. In order to lessen this, bamboo leaves should be incorporated into the diet gradually and in a way that balances their addition with other feed elements to provide enough nutrition overall.

- **Variability in Quality**

Age, season, and soil quality are some of the variables that might affect the nutritional value of bamboo leaves. To guarantee that the bamboo leaves used in livestock feed continuously satisfy the appropriate nutritional standards, regular testing and quality control procedures are required.

- **Processing and Preparation**

Proper processing of bamboo leaves, such as drying and grinding, can improve their palatability and nutrient availability. Ensuring that the bamboo leaves are free from contaminants and are processed to enhance digestibility can further improve their efficacy as a feed resource.

Chapter–VI

Conclusion

In Bangladesh, adding *Bambusa vulgaris* bamboo leaves to livestock feeds offers a promising chance to improve animal nutrition and productivity. The results of this study show that bamboo leaves are a good source of fiber and protein, but they also provide important minerals and vitamins that are good for the health of animals. The noteworthy increase in weight noted in goats and sheep, together with enhanced general health metrics, underscores the feasibility of utilizing bamboo leaves as a valuable addition to conventional feed materials. Despite the benefits, optimizing the benefits of bamboo leaves requires careful management of the high fiber content and diversity in nutritional quality. With careful feed formulation and a gradual introduction into diets, possible digestive problems brought on by their high fiber content can be minimized. Furthermore, the economic feasibility of utilizing bamboo leaves can greatly lower feed prices and improve the financial sustainability of livestock production, particularly in areas where bamboo is widely available.

Overall, this study supports the integration of bamboo leaves as a sustainable and economically feasible feed resource in livestock husbandry.

Chapter-VII

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Biography

I am Md. Tarek Zahaungir Biplab an intern student of Faculty of Veterinary Medicine at Chattogram Veterinary and Animal Sciences University from Kishoreganj (Upazilla: Bhairab). I have completed my Secondary School Certificate (SSC) and Higher Secondary Certificate (HSC) in 2014 and 2016 respectively. As a future veterinarian after completing DVM, I would like to be a Veterinary Surgeon.