

Rice straw and hydroponic fodder:

Low cost feeding approach for goat farming in rural India

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Goat plays a vital role in the food and nutritional security of the rural poor especially in the rainfed regions where crop production is highly uncertain. Rearing large animals is not always affordable for resource poor farmers and that is the most probable reason for selecting goat as the best alternative. Availability of affordable feed and fodder is the key to livestock development. With the increasing population and growing urbanization, common grazing land is shrinking steadily leading to shortage of feed, fodder and grasses. Small goat farmers, who are mostly dependent on common grazing land find it hard to maintain their flock. Under these circumstances, low cost alternative feeding options have been conceptualized, tested and demonstrated during the period from 2016 to 2019 with the aim to encourage the farming community. In this context, two different low cost technologies viz., 1) feed preparation using rice straw and 2) hydroponic fodder production have been tried in the animal unit of IFS farm of Uttar Banga Krishi Viswavidyalaya, West Bengal and after getting encouraging results, these technologies were disseminated through practical production-cum-demonstration units of fifty women goat farmers with active support of Animal Resource Development Department, Cooch Behar District, West Bengal. The article discusses the technological interventions, impact and possibilities of the intervention on goat farming.

Keywords: Goat husbandry, Hydroponic-fodder, Rice straw, Small-marginal goat farmers

PRIORITIZE clientele in respect of rural development are rural poor. Poor households own a larger share of livestock despite being land-poor. Distribution of goat is more equitable compared to land. It has been reported that the marginal farmers own two-third of small ruminants (goat, sheep) against the share of 24% land. Out of 138 million operational holdings, 85% belongs to small and marginal categories who are the main custodian of 75% goat population in India. Hence, development of goat husbandry considered to be an important pathway for comprehensive livelihood development.

Adequate feeds and fodder are essential for sustainable production

and productivity of the livestock. The growing gaps between demand and supply warrant concern over livestock rearing is a key livelihood and risk mitigation strategy, especially for

small and marginal farmers. As per the estimates of the Indian Council for Agricultural Research (ICAR)-affiliated National Institute of Animal Nutrition and Physiology (NIANP),

Table 1. Estimates of projected requirement of feeds and fodder in India (in million tonnes)

Different feeds & fodder	Particular	Year		
		2015	2020	2025
Dry	Requirement	491	530	550
	Availability	387	408	433
	Deficit (%)	21	23	21
Green	Requirement	840	880	1000
	Availability	619	596	600
	Deficit (%)	26	32	40
Concentrate	Requirement	87	96	105
	Availability	58	61	65
	Deficit (%)	34	36	38

Source: Standing Committee on Agriculture (2016-17)

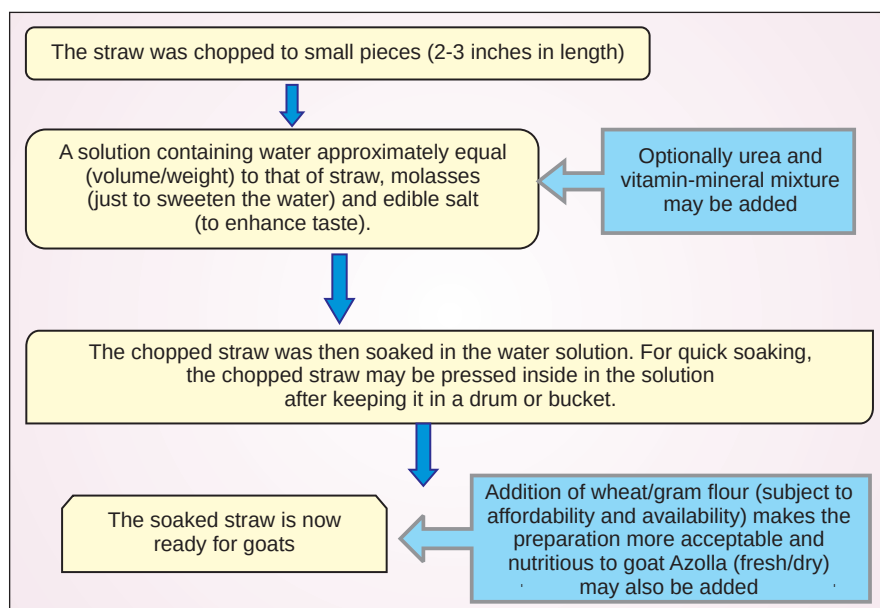


Fig. 1. Flow chart of the procedure for preparing feed using paddy straw

the deficit in the requirement and the availability of dry fodder, green fodder and concentrates during 2015 were to the extent of 21, 26, and 34 %, respectively. This is likely to increase to 23, 40, and 38%, respectively, by 2025. The deficit in India in terms of green fodder, dry fodder, and concentrates was 26 million tonnes (MT), 21 MT, and 34 MT in 2015, which is expected to reach 40 MT, 21 MT, and 38 MT by 2025, respectively (Table 1).

According to the advisory of the Department of Animal Husbandry & Dairying (DAHD) May 13 2019, the grazing lands are gradually diminishing due to pressure on the land for agricultural and non-agricultural uses. It also stated that the area under fodder cultivation is limited to about 4% of the cropping area, and it has remained static for the last four decades.

In order to solve the feed and fodder problem of small and marginal farmers, a strategy of low cost feed and fodder production approach has been taken up by the Uttar Banga Krishi Viswavidyalaya in collaboration with the Animal Resource Development (ARD) Department and Agriculture Technology Management Agency (ATMA) with direct participation of farmers in the Cooch Behar District of West Bengal, located in *terai* agro-climatic region. With an expectation

that the feed and fodder production technologies would increase the flock size and thereby would increase income of rural household. Two technological interventions, namely 1) utilization of rice straw as feed for goat and 2) low cost hydroponic fodder production were trialled and validated.

Utilization of straw as goat feed

There is a common belief which says “goat eats everything”. In practice, the common belief does not prove its validity. Goat usually does

not eat straw. Paddy straw is a kind of by-product, abundantly available in all rice growing areas particularly in eastern India where it is usually fed to the cattle. Due to mechanization in harvesting, burning of straw has now become the cheapest option for the farmers which has tremendous ill effects on the environment. Feeding goat with paddy straw may reduce the extent of burning.

One can mix feed supplements and additives for making the preparation more nutritious. The straw prepared in this way could be used as a staple feed for goat. In the present endeavour, most of the participant farmers used wheat flour and/ or azolla. Table 2 represents the quantity of necessary (Sl. No. 01-04) and optional ingredients (Sl. No. a-d) for making feed for goat using paddy straw (Fig. 2).

Low cost hydroponic-fodder production

Hydroponic technology has been in news for several years in India. Although application of the technology by resource poor farming community is very limited. Low cost hydroponic fodder production has been tried and tested in many regions in our country. Application and adoption of technology by small growers is a questionable issue. With implementation of the straw feeding method to goat, many farmers of the



Fig. 2. Visit to farmer's door (woman in red coloured top) to see goats feeding on rice straw.

Table 2. Items required for feeding 10 adult Black Bengal goats for one time

Sl. No.	Items	Quantity
01	Chopped rice straw (kg)	1.5
02	Drinking water (litre)	1.5
03	Molasses (<i>Gur</i>) (g)	100
04	Salt (g)	25-50
<i>Optional items that may be added with the feed for better result</i>		
a	Wheat/ gram flour (g)	200-300
b	Fresh azolla (g)	250-500
c	Vitamin-mineral mixture (g)	25-50
d	Urea* (g)	50-100

*only for goats above the age of 6 months

regions probably got courage to experiment with low cost hydroponic fodder production. Feeding straw and providing required nutrition to goat happens to be a concern for the entire implementing team. It is a well known fact that goat got chance to graze during the day to fulfil its nutritional need to a great extent. Providing green is a key issue for fulfilment of nutritional requirement if the animals are to be raised in absence of grazing. This is also a fact that with the available common grazing land the requirement of green cannot be realized. For the reason, low cost hydroponic-fodder production was thought of. The process was initially tested in the University and then validated in farmers' field with encouraging results.

Items and procedure for low cost production system

- Bamboo or wooden platform having 4-5 shelves was made by each of 50 participant farmers to accommodate 2-5 trays (2×1 sq. ft.) on which fodder was grown
- Trays perforated at the bottom for draining of water, required for frequent sprinkling over the germinated seed were stacked on the bamboo made platform.
- Seeds of maize and wheat were soaked overnight in a bucket and then germinated by draining water
- Germinated seeds (for maize : 700-800 g, for wheat: 500-600 g) were evenly spread over the trays
- Clean water was sprinkled frequently (2-3 hour interval depending on humidity in the air)
- The trays may be kept covered with a piece of cloth for at least 2-3 days till green leaves appear in order to prevent quick evaporation

- In few cases, trays were dipped in 0.1-1.5% sodium hypochlorite solution for 1 hour before soaking the seeds in normal water in order to prevent growth of fungus in the growing fodder.
- About 1.0 kg of seed in a tray can produce an average of 5.0 kg of fresh green fodder sufficient for six adult black Bengal goats for one time

Intervention for scientific goat husbandry practices

In order to get a visible effect of the low cost feeding approach as mentioned above, the entire goat population of the participating farmers were covered under periodic deworming, vaccination against PPR and goat-pox diseases which are common in the region. The women

were trained for scientific management, recording body temperature, assessing visible mucous membrane and process of medication in order to take care of their animals if required.

Advantage of implementation of technology

Goat management becomes easier

For most of the goat farmers in the region, feed is primarily managed by allowing the animals to graze in the adjacent common grazing area: beside rural roads and cultivable land. Continuous shrinking of common grazing land resulted in decreasing availability of grasses. Providing sufficient green to animals during grazing requires frequent displacement of pegging area. Hence, constant watch and attention is necessary. Many a times, the goats escape and enter the agricultural land and take contaminated grasses with agro-chemicals which lead to unspecific diarrhoea and sometimes death. This is probably one of the reasons behind rearing of small number of goats (less than 3) in rural area. Use of straw as feed along with making use of hydroponic fodder reduces the necessity of grazing. The animals can easily be managed by



Fig. 3. Production of hydroponic fodder in Cooch Behar district of West Bengal.

confining them inside the home premises by providing straw as mentioned above. With the interventions, It is also to mention that the average flock size has increased from 2.5 (July 2019) to 4.25 at present (February 2020).

Increase in body weight at market age

To take care of common ailments in goats, regular deworming and vaccination has been done apart from intervention on feeding. The average weight of the kids at the age of 5 months increase to 6.35 kg from 4.48 kg, assessed before intervention. In this part of West Bengal (Cooch Behar and adjoining districts), the young kids are slaughtered for meat when their body weight goes in the range of 6-10 kg. Therefore, the market age was reduced with increased sale price for their higher body weight. This is also to state that the mothers of goat managed with the hydroponic fodder returns to oestrous within two months (average) after the last kidding and thereby reproductive performance has been maintained in its optimum condition which is the key to the success of goat (Black Bengal) farming. It is a well-known fact that

hydroponic fodder is more nutritious than the fodder grown on land owing to the presence of roots, parts of seeds along with fodder.

Technology dissemination

Technologies are readily adopted when it serves the purpose of user. For the benefit of society, targeted dissemination is essential. Successful demonstration at the farmers' door made the technology more attractive to others. Various other departments, offices and farmers club visited the demonstration units at farmers' door for exposure and awareness of target community. Thus, the technology has become very familiar in the district of Cooch Behar and adjoining part. With the increasing options of feeding through easily manageable, affordable and low cost feeding techniques, the rearing has now become hassle-free for a farm household. Scarcity of feed, fodder and green due to dry season and also due to shrinkage of common grazing land as faced by the goat farmers can easily be managed by those two tested techniques.

goat rearing plays an important role in village economy. Feeding the goat throughout the year is a problem for resource poor villagers considering the paucity of green fodder and common grazing land. Utilization of readily available paddy straw as a feed as well as low cost hydroponics fodder production has emerged as a viable option for feeding goat. The farmers, especially women who are the custodian of goat genetic resource in the *Sub-Himalayan terai* region of West Bengal has accepted and adopted those low cost technologies for their livelihood with the active support from Uttar Banga Krishi Viswavidyalaya. This has become a successful venture where the farm household earned their livelihood with ease during the on-going pandemic situation, aroused due to the spread of new Corona Virus (COVID19). It requires further testing and refinement for making them suitable in the existing geo-climatic situation with the strategies for larger dissemination.

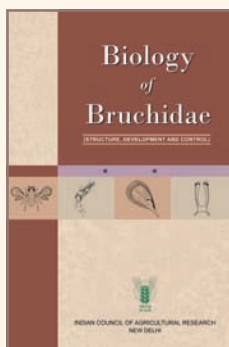
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SUMMARY

In the *terai* region of West Bengal,

Biology of Bruchidae

(STRUCTURE, DEVELOPMENT AND CONTROL)



The family Bruchidae includes simple and clean beetles, friendly in their appearance and open in their ways of life. Bruchids are in direct competition with human beings for exploiting the rich food sources and hence the concern for the suppression of the populations of pest species. Different control measures against bruchids can be successful only by first acquiring knowledge on the true identification, complete life-cycles and other biological characteristics of the pest species. At the same time, the host ranges, polymorphism, trophic relationship and interaction between pests and parasitoids, need to be studied for the success of any control measure. All these problems have been discussed in the '*Biology of Bruchidae*'. Although the details of the taxonomy are beyond the scope of this book yet a list of known Indian species along with their hosts and apparent identification remarks on the pest species have been added for the benefit of the workers interested in the Bruchidae. Also the recent nomenclature has been given for the species referred to in the text which is not usually available to researchers on different aspects of Bruchidae.

TECHNICAL SPECIFICATIONS

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