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# ***Fodder production - Importance in Dairy Farming and its Scope in Eastern India***

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## **ABSTRACT**

**Dairy farming has great potential in enhancing income, employment, nutrition security and livelihood of people in eastern India. Feeding of dairy animals with green fodders plays important role in economical dairy farming. India is bestowed with highest cattle population in the world but the productivity per animal is very low. Unavailability of quality feeds and fodders in their ration is the major reason. As the cost of components of concentrate feed are very high, green fodders are used to the maximum level in the ration to fulfil the nutrient requirements of dairy animals and to reduce cost of feeding. Inclusion of quality green fodders from both cereal and legume source not only reduce the cost of feeding but also increase the availability of nutrients which help in reproduction and milk production. Due to the shortage of land for sole fodder production for dairy animals in the eastern India, either intercropping method or mixed cropping method or marshy/low land may be used for fodder production. Hay and silage feeding are also the alternatives of dairy animal feed resources. Keeping the above things in mind, fodder calendar for year-**

**round fodder production (YRFP) may be prepared to make availability of green fodders for dairy animals.**

## **INTRODUCTION**

About 70% of Indians live in rural areas and depend on livestock production for both employment and subsistence. It accounts for 4% of the country's GDP. Livestock plays a significant role in helping smallholder livestock producers to alleviate poverty in addition to providing a reliable supply of milk, meat and self-employment opportunities for both rural youth, school drop outs, men and women. India is blessed with diversified type of livestock in the world. It has 20.4% of small ruminants, 12.5% of cattle, and 56.7% of the world's buffaloes. With almost 140 million tonnes produced annually, India is the world's largest producer of milk. But, the average yield of milk or meat in our animals is 20-60% lower than the global average. Due to limitations with feeding, breeding and health care, full production potential of these animals is not exploited. Moreover, half of the entire loss is attributed to the unavailability feeds and fodders (50.2%) which is followed by the issues with breeding and reproduction (21.1%), diseases (17.9%) and management (10.5%). Scarcity of feeds and fodders may be due to additional pressure on the land to grow foodgrains of growing human population and negligence towards growing fodder crops for dairy animals. On the other hand, green fodders are used in higher quantity in the ration of dairy animals to replace cost ingredients of concentrate ingredients. Thus, the input cost of dairy farming can be reduced to make it sustainable. Therefore, there is urgent need to bridge the demand-supply gap of feeds and fodders for enhancing milk production and improving reproduction of dairy animals.

## **PRESENT STATUS**

In India, green fodders are being cultivated in 8.4 mha land comprising of 5.23% area of our country. The area is found to be almost static for the last two decades (Koli and Bhardwaj, 2018). Not only that, the country is maintaining about 15% of total livestock population of the world in 2.29% of the global land area (Kumar *et al.*, 2023). According to the Union Ministry of Fisheries, Animal Husbandry and Dairying. Government of India, ICAR-Indian Grassland and Fodder Research Institute (IGFRI), Jhansi, has estimated that there is a deficit of 11.24, 23.4 and 28.9% in green fodder, dry fodder and concentrates, respectively, in our country. The deficiency may further be increased at the rate of 1.23% annually with the growing livestock population and considering the present production of fodders. Among different reasons, change of land use patterns, rapid urbanisation, negligence in maintaining pasture land, focus to use land for commercial crops, increase number of unproductive dairy animals, very few large sized commercial dairy farm, non-availability of quality fodder seed are important for decreasing green fodder availability for dairy animals. Various report envisaged that to meet out the green fodder requirement for present dairy animals, 14-17% of land should be devoted to fodder cultivation which is very difficult under present situations.

The total livestock population in eastern India i.e. Assam, Bihar, Chhattisgarh, Jharkhand, Odisha, eastern Uttar Pradesh and West Bengal state was about 159.8 million of which 77.8, 19.7, 4.8 and 52.2 million were cattle, buffalo, sheep and goat, respectively (Livestock Census, 2012). The region had 40.1% of cattle, 18.1% of buffalo and 38.7% of goat of total population of India.

The density of animals i.e. number of animals per sq km was comparatively higher in this region than the national average (223). Again, among seven eastern states, the density of livestock was highest in Bihar (350) followed by West Bengal (342) and lowest in Chhatisgarh (111). But, considering the intensity of milk production (tonnes/sq km), it was highest in eastern part of UP (86.8) and lowest in Odisha (12.0). In most of these states, dairy animals are being reared traditionally with crop residues, little home-grown concentrate ingredients and grazing in common including waste lands. Least emphasis is given on green fodder cultivation and its feeding.

### **WHY TO FEED GREEN FODDER TO DAIRY ANIMALS?**

Dairy animals should be provided with green fodders for the following reasons:

- It is the established fact that the cost of feeding accounts 60-70% of the cost of producing milk and concentrate feed is costlier than roughages/green fodders. Therefore, it is imperative to include green fodder in the dairy ration to make the cost of milk cheaper and to fulfil the required nutrients of dairy animals.
- Cattle/buffaloes have special digestive system and are capable of utilizing roughages/green fodders to convert it into valuable product i.e. milk. The bulk quantity of forage is also essential to fill the huge volume of rumen which aids proper digestion. Feeding of concentrate in large amount will not only create the problem of gas formation in the stomach but also it will increase the cost of feeding.
- Fodder crops provide all the critical elements like high digestible protein, carbohydrates, fats, minerals and vitamins. Green fodders are a very good source of B-carotene (precursor of vitamin A). Leguminous crops like lucerne, berseem and cowpea are rich in proteins, whereas, common cereal fodder crops like sorghum, maize and oats are very rich in energy. Legumes are excellent source of major and micro-minerals which are essential for rumen microorganisms.
- Since farmers believe that some of the fodder crops have a component that keeps the animal healthy and productive, fodder production has been practiced traditionally in most of the nation. Because of this, farmers have designated particular crop varieties and types for the production of fodder for generations, and they cultivate these based on the availability of land and water.
- Green fodder crops can help to decrease feeding costs by reducing the need to buy feed ingredients and concentrates from the market, as they are known to be less expensive sources of nutrients than concentrates.
- Crude fibre (CF) content in the ration has important role in digestion. The requirement of CF varies from different categories of animals. Moreover, amount of nutrients in a crop has a significant impact on its stage of harvest. Harvesting at the right time is essential because when a crop reaches maturity, its moisture and nutritional levels fall, and its fibre content rises. As green forage is the main source of CF in dairy animals and fibre content varies from stage of harvest of fodder, utmost care is to be taken while feeding animals.

**COMMON CULTIVATED FODDER CROPS IN EASTERN INDIA**

The common fodders which are being cultivated for feeding dairy animals in this region are given in the following table.

Growing season	Seasons	Fodder crops/grasses
<b>Kharif</b>	Cereal fodder	Fodder maize, fodder sorghum, fodder pearl millet and sugargraze
	Legume fodder	Fodder cowpea and cluster bean
<b>Rabi</b>	Cereal fodder	Fodder oat
	Legume fodder	Berseem and lucerne
<b>Perennial</b>	Grasses	Para grass, napier bajra hybrid (NBH), napier grass and lemon grass
	Fodder tree	Leucaena (Subabul)

In the existing tea garden of Assam, Black Pepper (*Piper nigrum*) vine can be suitably introduced as inter-crop by utilizing the shade tree plants as a support base for pepper vine. If it can be done by encouraging our small tea growers also, days are not far when Assam could be a major Black Pepper producing state in India. Efforts are being given at the Experimental garden for Plantation Crops of AAU, Jorhat given to take up Black Pepper cultivation with tea so that income can be maximised from the same piece of land.

**COMMON PACKAGE AND PRACTICES (AGRONOMIC PRACTICES) OF FODDER CROPS**

Fertilizer **Anti-quality factor** Weed control  
 Insect **Irrigation** Preparatory tillage  
 Crop geometry **Fodder yield** Method of sowing  
**Fodder varieties** **Forage yield** Plant protection  
 Harvesting **Multicut** **Seed yield** **Single cut**  
 Disease **Seed rate** **Time of sowing**

**FODDER CONSERVATION**

The surplus fodder can be preserved scientifically in the form of hay and silage to utilize it during the lean or fodder scarcity period for feeding of animals. The brief about hay and silage making has been given below.

**HAY MAKING**

Hay making refers to the process of preserving premium forages by drying. The goal of haymaking is to maintain the nutritional content of forages by drying them to a point where microbial decomposer activity is inhibited. The process of creating hay causes the moisture content to drop below 20% to stop the plant's enzymes from being active. Hay can be made from

thin-stemmed cereal crops such as sorghum, oat, guinea grass, range grasses, range legumes (especially Sylosanthes, Siratro and lablab bean), and all-purpose cultivated legume fodders such as lucerne, cowpea and berseem. Reducing the amount of water in the herbage allows it to be stored in bulk securely without fermenting or growing mould. This is the basic idea behind producing hay. This needs to be done with the least amount of leaf loss possible and without allowing rain to soak the hay.

### **SILAGE MAKING**

Silage is a technique for preserving green fodders that involves removing air (oxygen) from a feed mass in order to encourage lactic-acid bacteria to ferment sugars into lactic acid. This results in a decrease in pH and an increase in acidity, which prevents further degradation of the silage by plant enzymes (mainly protein-degrading enzymes), unwanted bacterial species (enterobacteria, clostridia), yeast, and moulds, as well as the lactic acid bacteria themselves. Forages with a high amount of fermentable sugar, low protein content, a poor buffering capacity and the right dry matter concentration during ensiling time are easier to ensile. The appropriate stage of growth for cutting different fodder crops for silage making is mentioned below.

- Sorghum - Flowering to dough stage.
- Maize - Milk to dough stage.
- Oat - 50% flowering to dough stage.
- Grasses - Early flowering stage.

Every load of recently chopped fodder is placed into the soil to release as much air as possible from the expanding silage heap. Lactic acid bacteria thrive in an oxygen-free environment because they can convert simple carbohydrates and starch into the potent organic acid lactic acid. Lactic acid builds up in the ensiled bulk as lactic acid bacteria proliferate, increasing acidity and lowering pH. The deteriorating effects of plant enzymes, unwanted bacteria (entobacteria and clostridium), yeast, and moulds are slowed down as pH drops. The growth of lactic acid bacteria and the majority of degrading enzymes are prevented when the pH is low enough (pH of 4.2-4.7 in alfalfa silage and 3.8-4.2 in maize silage). Therefore, the aim of silage-making is to remove oxygen from the forage mass to encourage lactic acid bacteria to ferment carbohydrates and to quickly lower the pH to eliminate any breakdown activity.

### **ALTERNATE SOURCES OF FODDER PRODUCTION (AZOLLA)**

Azolla belongs to the family Salviniaceae and is a fast-growing and free-floating aquatic fern. A symbiotic relationship is formed between azolla and blue green algae, *Anabaena azollae*. It can be given to ruminants, chickens, pigs and fish as a special kind of protein supplement. Azolla has the potential to supply cattle with a sustainable feed. Azolla has been identified as one of the most cost-effective and efficient livestock feed alternatives because of its high protein content and low lignin content (Jain *et al.*, 2019). Azolla contains 25.35% protein on a dry weight basis, 10.15% amino acids, bioactive compounds, and biopolymers. Azolla has very little in the way of oil and carbohydrates (Cherryl *et al.*, 2014; Kathirvelan *et al.*, 2015). You can substitute 15-20% of commercial feed with azolla.

### **THREATS OF FODDER PRODUCTION**

The fodder production in the region is under threats due to following reasons.

- The amount of land allotted for producing fodder decreases when cultivable land is under more strain due to growing human population.
- Rangelands are gradually deteriorating and diminishing in the lack of an efficient regulatory framework, which has major environmental effects.
- Lands used for grazing are being converted to different kinds of uses. Degradation of natural resources in arid and semiarid environments is accelerated by changes in livestock composition, especially an increase in the percentage of small ruminants and an excessive use of grazing resources.
- Forage crop and grassland productivity is being negatively impacted by climate change, water constraint brought on by recurring droughts, and an increase in weather uncertainty.
- Increasing worldwide rivalry for markets under WTO regulations presents a significant obstacle to the advancement of cattle farming.
- Greenhouse gas emissions in the environment are rising due to enteric fermentation.

### **YEAR-ROUND FODDER PRODUCTION (YRFP) MODEL**

Fodder is cultivated in different crop growing season (*Kharif-Rabi-Zaid*) throughout the year. But, during pre-rainy (May-June) and winter season (November-December), fodder growth is restricted due to abnormal weather and is characterised as lean period for green fodder production. The different innovative concepts with multidisciplinary approach may be followed to deal with and to increase fodder production to meet out feeds and fodder requirements of domesticated animals. For year-round fodder production (YRFP), the following points are to be considered:

- Inclusion of fodder crops in crop sequence.
- Growing of short duration forage crops in the gap periods of main crops.
- Increasing the production of crops which provide forage as by products like sugarcane, sunhemp, cowpea, turnip, carrot, cauliflower etc.
- By growing suitable fodder crops in fruit orchards for fodder as well as enriching the soil fertility.

For example:

- i) Mango, citrus, guava orchards- Anjan, Rhodes, Stylo and Siratro
  - ii) Vegetable orchards – 3 to 4 rows of napier bajra hybrid (NBH) and leucaena plants.
- Introducing of fodder trees (like subabul) tree in bunds of the farm or boundary of the farm.
  - Incorporating of non-conventional fodder (like edible cactus) in cultivable seasonal fodder sequence.
  - Multitier fodder cultivation may be good option for providing green fodder throughout the year.

The following YRFP model may be suited in this region.

- Maize + Cowpea – Teosinte + Rice bean (2 cuts) – Berseem + Mustard (3 cuts).
- M.P. Chari + Cowpea – *Dinanath* grass (2 cuts) – Berseem + Mustard (3 cuts).
- Para grass + *Centrosema pubescens* (8-9 cuts/year).

- Hybrid Napier or Setaria grass inter-planted with *Subabul* or Common Sesban (*Sesbania sesban*) (9-10 cuts/year).

### **SCOPE OF FODDER PRODUCTION IN EASTERN INDIA**

In spite of many limitations of green fodder production in eastern India, there are scopes to raise green fodders which have been pointed out as under.

- Dairy animals can consume wide variety of forages including legumes, non-legumes, grasses and other plants.
- Use of concentrate feed with little forage may be the alternate for dairy animal feeding. To reduce the cost, locally available and low-cost ingredients may be used to formulate least-cost ration.
- Creating awareness for green fodder production can support sustainable dairy farming through making use of marginal lands, enhancing soil health via rotation, and lowering erosion.
- For farmers, fodder production can be a profitable venture for revenue generation.
- On-farm fodder production helps to ensure feeds and fodder security of dairy animals.
- Providing cattle with high-quality fodder enhances their health and well-being, which in turn boosts farmers' productivity and profitability.
- The production of fodder can benefit the environment by increasing biodiversity and storing carbon.
- The production of fodder offers a wealth of opportunities for research and innovation. These include developing effective growing techniques, utilising technology like hydroponics and precision agriculture, and breeding programmes for nutrient-rich and high-yielding fodder kinds.
- By offering alternative forage options resistant to climatic extremes like drought or flooding, fodder crops can help to build climate resilience.
- Numerous governments support for fodder production through incentives, subsidies and technical assistance programmes as part of larger agricultural development initiatives can boost the fodder production. Farmers' acceptance and the potential for fodder production can both be increased with this support.
- Forage crop improvement also needs to be focused on understanding of species relationships, genome structure and chromosomal constitution, extent of gene exchange/recombination, putative parentage and nature of polyploidy along with normal breeding programs (Kumar *et al.*, 2023).
- Good quality fodder seeds are available with the State Governments and research institutes/universities. There is an urgent need to work closely together with these development departments and research organizations.

### **CONCLUSION**

Seasonal fodder and forage production along with fodder conservation viz., silage and hay making practices, one of the sustainable remunerative options for farmers. Thus, it is urgent announcement to all farmers that they are not only depends on crop production but also kept the

livestock at least one. This recommendation helps to cope up the agrarian distress affects the farmer's community.

## **REFERENCES**

Anonymous. 2011. Handbook of Agriculture. Indian Council of Agricultural Research, New Delhi, pp. 1353-1417. Anonymous. 2012. Nutritive value of commonly available feed and fodders in India. Animal Nutrition Group, National Dairy Development Board, Anand, India.

Cherryl D M, Prasad R M V, Jagadeeswara R S, Jayalaxmi P and Srinivas D K. 2014. A study on the nutritive value of azolla pinnata. *Livestock Research International*, 2(1): 13-15.

[https://dahd.nic.in/sites/default/files/RS2021.pdf#:~:text=\(a\)%20The%20ICAR%2DIndian%20Grassland%20and%20Fodder%20Research,market%20access%20to%20small%20and%20marginal%20farmers](https://dahd.nic.in/sites/default/files/RS2021.pdf#:~:text=(a)%20The%20ICAR%2DIndian%20Grassland%20and%20Fodder%20Research,market%20access%20to%20small%20and%20marginal%20farmers).

<https://www.srppublication.com/the-deficiency-of-23-4-of-dry-fodder-in-india-is-a-matter-of-great-concern/#:~:text=Editor's%20Pick-,The%20deficiency%20of%2023.4%25%20of%20dry%20fodder%20in%20India,a%20matter%20of%20great%20concern>

Jain R, Jain G and Singh N J. 2019. Azolla: An alternate fodder supplement in livestock feed. *Innovations in agriculture, environment and health research for ecological restoration*, pp:249-253.

Kathirvelan C, Banupriya S, & Purushothaman M R. 2015. Azolla-an alternate and sustainable feed for livestock. *International Journal of Science, Environment and Technology*, 4(4): 1153-1157.

Koli P and Bhardwaj N R. 2018. Status and use of pesticides in forage crops in India. *Journal of Pesticide Science*, 43: 225-232.

Kumar A, Sahoo B, Panda A K, Samal P, Sarangi D N and Srivastava S K. 2019. Forage crops in eastern India for improved livestock productivity. Published by the Director, ICAR-CIWA, Bhubaneswar, pp: 1-38.

Kumar S, Singh P, Devi U, Yathish K R, Saujanya P L, Kumar R and Mahanta S K. 2023. An overview of the current fodder scenario and the potential for improving fodder productivity through genetic interventions in India. *Animal Nutrition and Feed Technology*, 23: 631-644.