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Fodder Production for Livestock

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INTRODUCTION

Livestock production is one of the important sectors of agriculture that help in generating employment in rural areas. There are many types of livestock animals which include cattle, buffaloes, sheep and goats. They help in producing milk, meat and manure for their masters. These livestock animals depend upon many factors such as breed, health, housing, availability of water and most importantly quantity and quality of feed. Fodder helps in providing energy, proteins, fibre, minerals and vitamins which are very essential for the growth and maintenance of livestock animals.



Fodder means cultivated or naturally grown plant material which is fed to livestock either in fresh form or in preserved form. Green fodder comes from grasses, cereal crops, leguminous plants and some fodder trees, while dry fodder is available in the form of wheat straw, rice straw and dry grasses. Proper balance in livestock feeding should be maintained through green fodder, dry roughage, concentrate, mineral mixture and drinking water depending upon the species of animal, its age and body weight.

In India, availability of sufficient fodder poses one of the main problems for farmers. Competition between food and fodder crops for land, irregular rainfall, limited irrigation and insufficient access to quality planting material contribute to seasonal shortages. Therefore, scientific fodder production and conservation are essential for improving livestock productivity, reducing feeding costs and strengthening the sustainability of agricultural systems.

2. Importance of Fodder Production

Production of fodder affects the health and production of livestock and profitability of farms. Green fodder provides nutrients that ensure proper function of rumen, development, reproduction and lactation. The leguminous fodders like berseem and lucerne have higher proportion of crude protein compared to the mature cereal grasses whereas maize and sorghum produce high biomass and energy.

Growing of fodder on farm reduces dependence on purchasing green fodder and helps to stabilize feeding expenses. Perennial grasses and rotation of crops make the efficient use of agriculture lands possible. Fodder legumes are beneficial to soil through nitrogen fixation biologically and their roots and residues improve the organic content in soil.

Fodder production provides job opportunities to grow and market green fodder, hay, silage, seeds and planting materials. Moreover, fodder conservation allows farmers to store excess fodder during season of its high production and consume in times of drought, summer scarcity or unfavorable seasons.

3. Important Fodder Crops

The main categories of fodder crops include cereal fodders, leguminous fodders, perennial grasses and fodder trees.

3.1. Cereal fodder crops

Some of the common cereal fodder crops include maize (*Zea mays*), sorghum (*Sorghum bicolor*), pearl millet *(Cenchrus americanus*) and oats (*Avena sativa*). These plants usually produce large amounts of biomass and provide energy and fibre. Maize is an ideal fodder for making silage, while sorghum and pearl millet are beneficial under warm and relatively dry environments. Oats are widely grown in winter where conditions permit. Selection of crops and varieties should be made based on environmental considerations.

3.2. Leguminous fodder crops

Important leguminous fodder crops include berseem (*Trifolium alexandrinum*), lucerne (Medicago sativa), cowpea (*Vigna unguiculata*) and cluster bean (*Cyamopsis tetragonoloba*). Leguminous crops are usually rich in protein as compared to matured cereal fodder crops. Hence, they are able to enhance nutritional value of livestock feed. Berseem and lucerne are ideal winter fodders in areas that permit their growth, while cowpea and cluster bean are well-adapted to warm climates.

3.3. Perennial fodder grasses

Hybrid Napier and Guinea grass (*Megathyrsus maximus*) are good examples of perennial fodder grasses. They can yield repeatedly over a long period if sufficient water and nutrients are provided. The hybrid Napier is especially beneficial for dairy farms with irrigation facilities. It is necessary to cut the crop on time, use appropriate planting materials, have correct spacing and fertilize properly.

3.4. Fodder trees and shrubs

Trees that can be used as fodder include *Leucaena leucocephala* and *Morus alba*. These trees can be used in field boundaries and agroforestry situations as well as where agricultural land is scarce. But it is important to ensure that the tree foliage is mixed into the ration appropriately. Excessive feeding of leucaena can lead to poisoning due to the mimosine present in it.

4. Scientific methods of cultivation

4.1. Choice of crops and cultivars

Choice of crops for fodder production should be made considering the agro-climatic condition, fertility of the soil, irrigation facilities, season and the feeding requirement of livestock. Cultivars developed by Agricultural Universities and ICAR Institutes should be preferred. The important criteria for choice include biomass productivity, nutritive value, regenerative property, drought resistance, disease resistance and possibility of preservation.

4.2. Soil preparation and sowing

Soil preparation should provide good seedbed for uniform germination and successful growth. Good quality seeds and planting material should be used along with proper time of sowing, sowing rate, depth and spacing as per local recommendations. Line sowing will help in performing intercultural operation. Perennial grasses can be established using rooted slips and stem cutting method.

4.3. Management of nutrients

The fodder crops utilize substantial amount of nutrients through harvesting. Testing of the soil would ensure proper use of the farmyard manure, compost, and mineral fertilizers. Nitrogen is required for vegetative growth while phosphorous and potassium for root development, energy metabolism and regrowth. Fodder legumes would fix the nitrogen from the atmosphere, but phosphorous, favorable soil and rhizobium nodules would also be necessary. Fertilizer application in excess should be avoided since it would increase costs and might result in loss of the nutrient and nitrate toxicity in some crops.

4.4. Irrigation and water management

The requirement of water varies with species, stage of growth, soil, temperature and rainfall. Proper irrigation should avoid moisture stress and waterlogging. Irrigation methods such as drip or sprinkling irrigation, soil moisture measurement, water harvesting and proper irrigation schedule would enhance the efficiency of water utilization. Drought tolerant fodder crops and delayed sowing could minimize the chances of shortage of feed in areas with unpredictable rainfall.

4.5. Weed, pest and disease management

Weeds compete with fodder crops for light, moisture and nutrients, especially during early growth. Timely intercultivation, crop rotation, clean seed and suitable weed-management practices help maintain crop productivity. Integrated pest management, regular field monitoring and disease-resistant varieties should be adopted wherever available. Any pesticide use must comply with approved labels and applicable feed-safety requirements.

4.6. Harvesting at the appropriate stage

Harvesting time strongly influences fodder quality. Young forage generally has higher protein content and digestibility, while delayed harvesting increases fibre content and may reduce digestibility. However, excessively early harvesting can reduce biomass yield and weaken perennial plants. Crops should therefore be harvested at the stage recommended for their intended use. Special attention is required when feeding sorghum because young, drought-stressed or frost-affected plants may contain hazardous levels of prussic acid, while nitrate accumulation can occur under certain conditions. Potentially unsafe forage should not be fed without appropriate assessment and safe management.

5. Fodder Production Season Wise

The year-round availability of fodder may be ensured by planting crops that grow in different seasons. In kharif season, maize, sorghum, pearl millet and cowpea may provide green fodder. In winters, berseem, oats and lucerne may be planted in most regions. In summer, cowpea, appropriate varieties of maize and perennial grasses may help supplement the feed availability. Farms can partition their fields into

multiple plots and plant crops at varying dates so that harvesting becomes spread out through time. Intercropping cereal and leguminous crops can ensure good nutrition content in forage provided the cropping system is appropriate to the region. Perennial grasses may form the basis of fodder production in those regions where irrigation and nutrients are sufficient.

6. Fodder Conservation Methods

Fodder production tends to be seasonal and there might be excess of forage during favorable seasons of the year. Conservation helps the farmers in storing this excess fodder for later use during times when there will be no fresh fodder available. The two common practices of conserving fodder include hay making and silage preparation.

6.1. Hay Making

The process of hay making includes drying of the green forage up to a moisture content which would enable the storage of fodder safely. The proper grasses and legumes can be harvested and dried under favorable weather conditions. Exposure to too much of sunlight and excessive handling of the forage, especially the leafy legumes results in loss of nutrients. Well dried hay should then be stored in a dry and airy place.

6.2. Silage Preparation

Silage is made by storing the chopped forage in a hermetically sealed environment and undergoing fermentation process. Maize and proper sorghum are the crops used in this process. The crop is harvested and chopped while maintaining an appropriate stage of development and moisture content, which is further packed in a silo. Excessively wet material can cause undesirable fermentation and nutrient losses, while very dry forage may be difficult to compact properly. Once a silo is opened, exposure to air should be minimized to prevent spoilage. Silage making is particularly useful for dairy farms because it allows seasonal surpluses to be stored for periods of feed scarcity.

The major steps in silage preparation are:

1. Harvest suitable forage

Select the appropriate crop maturity and moisture level.

2. Chop the forage

Use a suitable chopper for uniform particle size.

3. Fill and compact

Pack the material tightly to remove trapped air.

4. Seal airtight

Use a suitable silo, pit or airtight bag and prevent leakage.

5. Ferment and inspect

Allow adequate fermentation and inspect before feeding.

7. Contemporary Technologies for Fodder Production

Hydroponic fodder production is based on seedling growth of seeds without soil within a controlled or semi-controlled environment. Maize is used, and the fodder is cut down after around seven days, depending on the technology. It can create fresh biomass within a small area and can be helpful in areas with limited land. But the high moisture percentage of the fodder makes an increase in fresh mass not proportional to dry mass and nutrient percentage. Therefore, cost of seeds, electricity, labor, sanitation and infrastructural aspects have to be taken into consideration prior to using it. Precision irrigation, soil moisture sensors, weather-based advisories, and digitalized farm records can assist farmers in efficient management of water and other inputs. Better perennial fodder grasses and high-yield varieties can be additional options for improved year-round availability of fodder. All these technologies have to be tested regarding their suitability, nutrition, economic benefits and costs.

8. Integration of Fodder Production with Livestock Farming

The integrated system of fodder and livestock farming involves the production of fodder, use of crop residues, recycling of manure and animal rearing. Straw of wheat, rice and other agricultural residues can be used as fodder, but their protein levels and digestibility may be inadequate. Thus, they need to be complemented by other kinds of green fodders, concentrates, minerals, and other ration components as needed.

Agroforestry can include fodder trees, grasses, and leguminous crops. Animal manure can help in providing nutrients to the fodder crop, while fodder crops can serve as feed for the animals. This way, there will be efficient resource management if nutrient management and quality feed are done in an appropriate manner. Rations must be designed in accordance with animal type, size, growth stage and productivity.

CONCLUSION

The production of fodder serves as a cornerstone of sustainable animal husbandry practices since it enhances the nutritional status of animals, their productivity, farm efficiency and farmers' livelihoods. Scientific growth of cereal fodders, leguminous plants and perennial grasses with the use of proper fertilization, efficient irrigation and timely harvest may lead to the improvement of feed availability both in terms of volume and quality. The planning of seasonal crops and their conservation through haymaking and silage making is necessary for ensuring year-round feed availability. Technological solutions such as hydroponic fodder growing and precision irrigation, along with crop-livestock integration, present an additional opportunity provided that they are used wisely.

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