Dairy Worker

(Job Role)

Qualification Pack: Ref. Id. AGR/Q4102
Sector: Agriculture

Textbook for Class IX

17909

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NCERT
राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

17909—Dairy Worker
Textbook for Class IX

ISBN 978-93-5729-585-7

First Edition
March 2025 Phalguna 1946

PD 2T BS

₹ 145.00

Printed on 80 GSM paper with NCERT watermark

Published at the Publication Division by the Secretary, National Council of Educational Research and Training, Sri Aurobindo Marg, New Delhi 110 016 and printed at Pushpak Press Pvt. Ltd., 203–204, DSIDC Complex, Okhla Industrial Area Phase I, New Delhi–110020

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Foreword

The National Curriculum Framework (NCF) 2005 recommends bringing out work and education into the domain of the curricular, infusing it in all areas of learning while giving it an identity of its own at relevant stages. It explains that work transforms knowledge into experience and generates important personal and social values, such as self-reliance, creativity and cooperation. Through work, one learns to find one's place in the society. It is an educational activity with an inherent potential for inclusion. Therefore, an experience of involvement in productive work in an educational set up will make one appreciate the worth of social life and what is valued and appreciated in the society. Work involves interaction with material or other people (mostly both), thus, creating a deeper comprehension and increased practical knowledge of natural substances and social relationships.

Through work and education, school knowledge can be easily linked to learners' life outside the school. This also makes a departure from the legacy of bookish learning and bridges the gap between the school, home, community and workplace. The NCF 2005 also emphasises Vocational Education and Training (VET) for all those children who wish to acquire additional skills and/or seek livelihood through vocational education after either discontinuing or completing their school education. VET is expected to provide a 'preferred and dignified' choice rather than a terminal or 'last resort' option.

As a follow-up of this, the NCERT has attempted to infuse work across subject areas and also contributed towards the development of the National Skill Qualification Framework (NSQF) for the country, which was notified on 27 December 2013. It is a quality assurance framework that organises all qualifications, according to the levels of knowledge, skills and attitude. These levels, graded from one to ten, are defined in terms of learning outcomes, which the learner must possess regardless of whether they are obtained through formal, non-formal or informal learning. The NSQF sets common principles and guidelines for a nationally recognised qualification system, covering schools, vocational education and training institutions, technical education institutions, colleges and universities.

It is under this backdrop that Pandit Sunderlal Sharma Central Institute of Vocational Education (PSSCIVE), Bhopal, a

constituent of the NCERT has developed learning outcome-based modular curricula for vocational subjects from Classes IX to XII. This has been developed under the Centrally Sponsored Scheme of Vocationalisation of Secondary and Higher Secondary Education of the Ministry of Education (erstwhile Ministry of Human Resource Development), Government of India.

This textbook has been developed as per the learning outcome-based curriculum, keeping in view the National Occupation Standards (NOSs) for the job role and to promote experiential learning related to the vocation. This will enable the students to acquire necessary skills, knowledge and attitude.

I acknowledge the contributions of the book development team, reviewers, and all institutions and organisations for supporting towards the development of this textbook.

The NCERT welcomes suggestions from students, teachers and parents, which would help us to further improve the quality of the material in subsequent editions.

DINESH PRASAD SAKLANI
Director
National Council of Educational
Research and Training

New Delhi
September 2022

About the Textbook

A 'Dairy Worker' is employed by a dairy farmer at a cattle farm. The person performs various activities at the dairy farm like feeding, rearing and milking the livestock. Rearing or taking care of dairy animals involves performing activities to meet their nutritional and health needs, and ensuring their comfort at all times. Besides, it includes ensuring appropriate disposal of manure and other animal and farm wastes, and keeping the animal sheds and other farm areas clean, i.e., free from dung and other contaminating material.

As the aim of farm is to produce maximum and quality milk, the role of a Dairy Worker becomes all the more important. The person has to manage day-to-day farm operations and work independently, with the ability to make several operational decisions with regards to the job role. Apart from being adept at animal handling, one must be able to use the milking equipment efficiently, in case of employment at a large farm.

On completion of the course, students would be able to:

- understand the importance of dairy farming;
- know about job opportunities in dairy farming;
- know about the major dairy cattle breeds;
- prepare livestock accommodation, and ensure animal health and comfort;
- prepare and store animal feed; and
- ensure adequate feed and water supplies for livestock.

The textbook has been developed with the help of industry and academic experts. Care has been taken to align the contents of the textbook with the National Occupational Standards (NOSs) for the job role. The NOSs for the job role covered in the textbook are as follows:

- AGR/N4101—Prepare and maintain livestock accommodation
- AGR/N4102—Establish livestock within accommodation
- AGR/N4108—Transfer livestock to another location
- AGR/N4103—Provide feed and water for livestock

The textbook consists of six units. Unit 1 gives an overview of dairy farming in India. Unit 2 gives details of some of the important dairy cattle breeds that students opting for the job role must be aware of. Unit 3 discusses various aspects of housing for dairy animals. It also underlines the importance of regular and timely disposal of

manure at a farm. Unit 4 presents the general layout for a large dairy farm and the various structures that need to be set up there. Unit 5 describes the purposes and modes of animal transportation. Unit 6 gives insight to feed and water arrangements that need to be made for dairy animals.

The job role of a Dairy Worker has been covered in Classes IX and X. The successive course is that of Dairy Farmer, which has been dealt with in Classes XI and XII. A conscious effort has been made in the textbooks of Dairy Worker to impart only elementary knowledge to students opting for the job role.

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ACKNOWLEDGEMENTS

The National Council of Educational Research and Training (NCERT) expresses gratitude towards all members of the Project Approval Board (PAB) and officials of the Ministry of Education (erstwhile Ministry of Human Resource Development), Government of India for their cooperation in the development of this textbook. The Council acknowledges all contributors for providing valuable inputs and insight that helped in shaping the textbook.

Rajesh P. Khambayat, *Joint Director*, Pandit Sunderlal Sharma Central Institute of Vocational Education (PSSCIVE), Bhopal, is appreciated for rendering constant support during the development of this textbook.

The contributions of our colleagues at the Department of Curriculum Studies (DCS), NCERT and members of the textbook review team—Ranjana Arora, *Professor* and *In charge*, Curriculum Group, and K.V. Sridevi, *Assistant Professor*, DCS, NCERT are duly acknowledged.

Mukur Ganguly (*Assistant Professor*) and Preeti Dixit (*Assistant Professor*) from the Department of Agriculture and Animal Husbandry, PSSCIVE, Bhopal are also appreciated for providing valuable inputs towards the development of this textbook.

The Council also acknowledges P. D. Juyal, *Vice Chancellor*, Nanaji Deshmukh Veterinary Science University (NDVSU), Jabalpur, Madhya Pradesh for being a constant source of encouragement, and Biswajit Roy, *Associate Professor*, Department of Livestock Production Management, NDVSU for providing photographs and illustrations used in the textbook.

The Council is also thankful to the Indian Veterinary Research Institute, Izatnagar, Uttar Pradesh and its faculty members in the Livestock Production Management Department for reviewing the textbook and providing relevant photographs.

The photographs used in the textbook have been selected with care and diligence for providing a better and clearer understanding to students. Care has been taken not to violate any copyright issue. The images are meant for educational purpose only and are being provided for the personal use of the students and teachers.

Gratitude is due to the Publication Division, NCERT for transforming the manuscript into an attractive and enriching textbook. Special thanks are due to Sweta Jha, *Editor* (contractual) and Sneha Jha, *Proofreader* (contractual), for copyediting and finalising this textbook. Pawan Kumar Barriar, *In charge*, DTP Cell, Publication Division, NCERT; Ajay Kumar Prajapati and Upasana, *DTP Operators* (contractual) are appreciated for layout and design.

Contents

THE CONSTITUTION OF INDIA

PREAMBLE

WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a [1]**[SOVEREIGN SOCIALIST SECULAR DEMOCRATIC REPUBLIC]** and to secure to all its citizens :

JUSTICE, social, economic and political;

LIBERTY of thought, expression, belief, faith and worship;

EQUALITY of status and of opportunity; and to promote among them all

FRATERNITY assuring the dignity of the individual and the [2][unity and integrity of the Nation];

IN OUR CONSTITUENT ASSEMBLY this twenty-sixth day of November, 1949 do **HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.**

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1. Subs. by the Constitution (Forty-second Amendment) Act, 1976, Sec.2, for "Sovereign Democratic Republic" (w.e.f. 3.1.1977)
2. Subs. by the Constitution (Forty-second Amendment) Act, 1976, Sec.2, for "Unity of the Nation" (w.e.f. 3.1.1977)

Unit 1

An Overview of Dairy Farming in India

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Dairy farming has been an important part of the country's agricultural scenario since time immemorial. India, predominantly being an agrarian economy, has about 70 per cent of its population living in villages, where livestock rearing plays a crucial role in the socio-economic life of people. The dairy sector, thus, constitutes an important part of the rural economy and is a source of employment to millions of people, especially those living there.

Apart from creating employment opportunities, the sector also meets the nutritional needs of people as it ensures supply of quality milk and milk products in both urban and rural areas. With the aim of keeping pace with the country's increasing demand for milk and milk products, the industry has been growing at an exponential rate.

According to the Department of Animal Husbandry and Dairying, India is the largest producer of milk, making up to 23 per cent of the world's total milk production annually (https://dahd.nic.in/invest-india). Besides, India houses the largest bovine population in the world. Under such conditions, the Indian dairy market is expected to exhibit an even stronger pace of development in coming years.

Importance of Dairy Farming in India

Dairy animals have been of paramount economic importance ever since ancient times. More than serving as a source of economic enterprise, livestock rearing is associated with the country's tradition and a family's socio-economic status. Some of the important sociocultural traditions are linked with the domestication of animals.

Due to the spread of education and growing nutritional awareness, the demand for milk is continuously increasing in the country. Milk is considered to be a complete food. It contains various nutrients (in appropriate proportions), as required by the human body, in easily digestible form. Inclusion of milk in the regular diet of a person also increases the digestibility of other food items that one consumes.

Milk Production in India

The total milk yield varies in different countries—some are surplus producers, while some have a deficit production, and in some, the availability just matches the requirement. In India, a large number of farmers carry out dairy farming in small, medium and large-sized farms.

According to the Department of Animal Husbandry and Dairying, in the case of milk production, the National Action Plan for dairy development envisaged to achieve a target of 254.5 million MT by 2022 and 300 million MT by 2023–24 from 155.5 million MT during 2015–16, requiring an annual growth rate of 8.56 per cent, which would lead to an increase in per capita availability of milk from the present 337 grams per day to 515 grams per day by 2022 and 592 grams per day in 2023–24, thereby, addressing the substantial nutritional requirement of the country's growing population.

Buffaloes yield almost half of the total milk produced in the country. In India, milk is produced by a large number of small, medium and large-sized farms. There is an exponential growth in the number of commercial dairy farms in urban and semi-urban areas of the country. It is clear from Fig.

1.1 that 49 per cent of the total milk is produced by buffaloes, followed by 27 per cent, 21 per cent and 3 per cent from crossbred and exotic cows, indigenous cows, and goats respectively. Small quantity of milk is also procured from camel, sheep and yak. Uttar Pradesh is the largest milk producer in India, followed by Rajasthan. The per capita availability of milk is the highest in Punjab, followed by Haryana (*Basic Animal Husbandry Statistics*, Government of India, 2017; and *Annual Report* 2019–20, Department of Animal Husbandry and Dairying Ministry of Fisheries, Animal Husbandry and Dairying Government of India, p. 6).

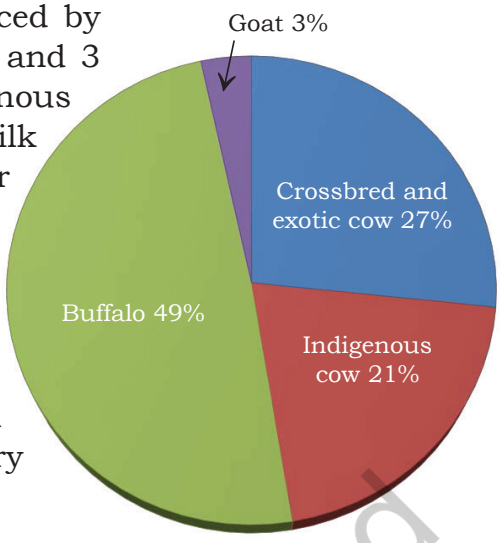

Fig.1.1: Milk production on the basis of different dairy animals in India

Government Initiatives and Private Participation

The Government of India has launched a number of dairy programmes, aiming to improve cattle productivity and increase milk production in the country, like the National Programme for Bovine Breeding and Dairy Development, the Rashtriya Gokul Mission, and the Foot and Mouth Disease-Control Programme (FMD-CP), etc., to name a few. Strengthening and expanding milk procurement infrastructure and providing greater market access to farmers, especially in rural areas, are some of the major initiatives with regards to the growth of the dairy sector in the country, which would further lead to increased global business.

The industry also serves as a medium of socio-economic development in India as private participation in the sector has increased phenomenally over the past few years. Numerous national and international players are entering the industry, considering the size and potential of the Indian market. The focus is now on producing value-added products, such as cheese, yogurt, probiotic drinks, etc. Keeping in mind the requirements of Indian consumers, innovative dairy products are being produced and introduced in the market. As a result, the sector is generating new job opportunities for the Indian youth.

Employment Potential in Dairying

Dairy farming has matured into a professionally-managed industry in India. Large commercial dairy farms need the services of educated dairy workers to carry out different dairying operations.

According to the *LMIS Report on Dairy Sector*, published by the Agriculture Skill Council of India, the sector employs about 8.47 million people annually, of which 71 per cent are women.

It must also be noted that conventional dietary habits in India account for about 60 per cent of the total milk consumption, i.e., in liquid form and the remaining in the form of *ghee*, cheese, curd, ice cream, dairy whiteners, traditional sweets, etc., thereby creating a need for a skilled workforce ('Management Practices for Successful Dairy Farming', *epashupalan,* 21 June 2021).

Dairying provides a source of daily income with a relatively low level of risk. Most dairy farmers in the country rear animals at a small scale, using traditional ways. There is a need for such farmers to run their businesses in a scientific manner in order to increase their productivity and businesses. But most of them are not aware of the modern methods of dairy farming. To ensure maximum production and profits from dairy farming, it is essential that these farmers adopt appropriate business plans and dairy management practices.

Fig. 1.2: Draught and traction power for agriculture and rural transport

Nearly 43 per cent of Indian farmers are small cultivators, and about 26 per cent are agricultural labourers, who have one or two milch animals (Planning Commission, GOI, 2009). This indicates that the dairy sector provides basic sustenance for small farmers, and landless and agricultural labourers, especially those living in the draught prone areas of Rajasthan and Gujarat.

Apart from meeting the nutritional needs of people, the sector also provides draught and traction power for agriculture and rural transport, and manure, fuel

and raw material for the manufacturing sector, thus, generating immense employment opportunities.

Self-employment opportunities

Jobs in the Indian dairy market are mainly in areas of production and processing of dairy products. Students opting for the job role need to understand that with globalisation of the animal husbandry industry the markets are now demand driven and not supply driven. After completion of the course, the students can work in a small milk production unit with up to 20 animals. One can also set up a dairy products unit, manufacturing cheese, *shrikhand*, ghee, butter, paneer, flavoured yoghurt and other milk-based consumables.

Check Your Progress

A. Multiple Choice Questions

1. Which state produces the maximum quantity of milk in India?
   (a) Uttar Pradesh
   (b) Madhya Pradesh
   (c) Punjab
   (d) Haryana
2. The contribution of buffalo milk to the total milk production market in India is about _____ per cent.
   (a) 25
   (b) 49
   (c) > 60
   (d) None of the above
3. Most dairy farmers in India adopt _____ method of dairying.
   (a) Scientific
   (b) Traditional
   (c) Both (a) and (b)
   (d) None of the above
4. According to the Department of Animal Husbandry and Dairying, the National Action Plan for dairy development tries to achieve a milk production target of _____ million MT by 2022.
   (a) 155.5
   (b) 300
   (c) 254.5
   (d) None of the above

Success Story

Chakradhar Gade and Nitin Kaushal, who graduated from the Indian Institute of Management, Indore, started their own dairying venture, after hearing complaints about adulterated or diluted milk. They studied the prevailing dairy market for over six months and concluded that an organised supply of milk would be an ideal way to begin their venture. They tied up directly with five large-scale farmers, eliminating the role of middlemen. As soon as the milk was produced by the animals, it was quality tested at the farmers' location for safe consumption. It was only after the quality test that the milk reached a distribution centre, where it was pasteurised and packaged for delivery. Along with the bill, the customers were requested for feedback as well.

B. Fill in the Blanks

1. According to the Department of Animal Husbandry and Dairying, India is the _____ of milk, making up to _____ per cent of the world's total milk production annually.
2. Goats yield around _____ per cent of the total milk produced in the country.
3. One of the dairy schemes launched by the Government of India is _____.
4. About 27 per cent of the country's total milk is produced by _____.

C. Mark 'True' or 'False'

1. In India, the maximum quantity of milk is sold in the form of milk products.
2. Dairy provides seasonal income to farmers in India.
3. Cows are the largest producers of milk among dairy animals.
4. The dairy sector is demand driven and not supply driven.

Unit 2

Important Dairy Breeds in India

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One may have observed cows of different colours with varied physical characteristics like difference in the shape of horns, height, body structure, etc. Similarly, one may also have noticed difference in the physical features of buffaloes found in different parts of India and abroad. Such differences are found because these animals belong to different breeds.

A 'breed' is characterised by a sufficiently large group of animals evolved by human efforts following the principle(s) of breeding. The rearing of domestic animals in controlled conditions in order to improve their desirable qualities like milk yield, etc., is called 'animal breeding'. Members of one breed share a common ancestry and possess similar physiological characteristics.

Body Parts of Cows

A dairy worker must be aware of the various body parts of cows and buffaloes. A careful look at the picture of cows and buffaloes can help one spot the similarities and differences in their body structure. The body of both cows and buffaloes are similar, except for the hump and the dewlap that are found only in cows (Fig. 2.1).

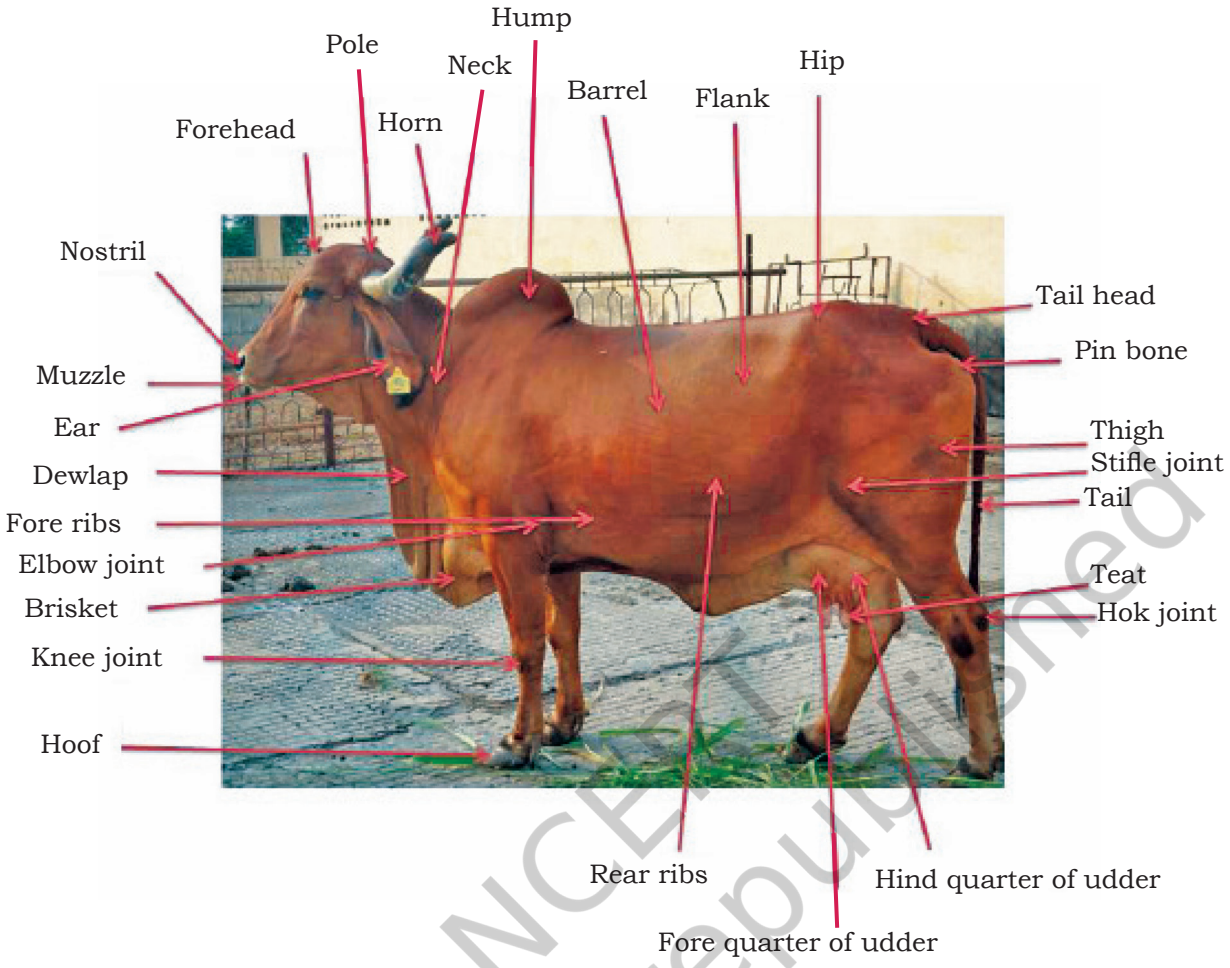


Fig. 2.1: Different body parts of a cow

Indigenous and Exotic Cow Breeds

In India, many cow breeds—both indigenous (desi) and crossbred—are engaged in milk production (Table 2.1 and 2.2). Based on their utility, they are classified into milch, dual and draft purpose animals. There are 41 registered indigenous cow breeds in India, some of which are of milch type like Gir, Hariana, Sahiwal, Red Sindhi and Tharparkar (Table 2.1). Some of the important indigenous and exotic cow breeds are shown in Fig. 2.2 (a–d) and Fig. 2.3 (a–d), respectively.

Crossbred populations have been developed by crossing exotic cattle breeds (*Bos taurus*) like Holstein

Friesian, Brown Swiss and Jersey with indigenous breeds (*Bos indicus*). Exotic cow breeds have higher milk production potential and are not adapted to Indian climatic conditions.

Table 2.1: Common Indigenous (desi) Cow Breeds

S. No.	Breed	Habitat	Colour	General description	Utility	Average lactation yield (in 305 days)
1.	Gir	Kathiawar region of Gujarat	Shiny red with black hue; a few white spots are also found in some cows	It has a voluminous dewlap and a moderately developed sheath. The hump is well-developed and lies in front of the withers. The limbs are widely placed but are not so muscular.	These cows have a high milk production potential. Gir bullocks are heavy and strong, but are moderately paced in movement.	2110 litres with 4.6% fat
2.	Sahiwal	Punjab	Reddish or pale red, and sometimes with white patches	These medium-sized cows have a broad forehead. They have bright eyes and blunt thick horns. The hind quarters are well-developed.	Bullocks are used both for ploughing and carting. Cows are good milkers.	2325 litres with 4.9% fat
3.	Hariana	Haryana, western Uttar Pradesh and eastern Rajasthan	White or light grey	The animals have a pole on top of their forehead. Their short and curved horns emerge from the outer angle of the pole. The animals have sharp and small ears. The dewlap is small and the udder is well-developed.	Bullocks are used for draught purposes like ploughing and transportation. Cows are good milkers.	600 to 800 litres with 4.2% fat

4.	Tharparkar	Marwar region of Rajasthan and Gujarat	White or light grey	The animals have short, straight and strong limbs. They have a moderately long face with a broad pole and a slightly bulging forehead. Males give an impression of virility. Horns are of medium size. In young animals, there is a white or light grey line along the spine.	Bulls are used for ploughing and carting. Cows are exceptionally good milkers.	1749 litres with 4.8% fat

(a) Gir cow

(b) Sahiwal cow

(c) Red Sindhi

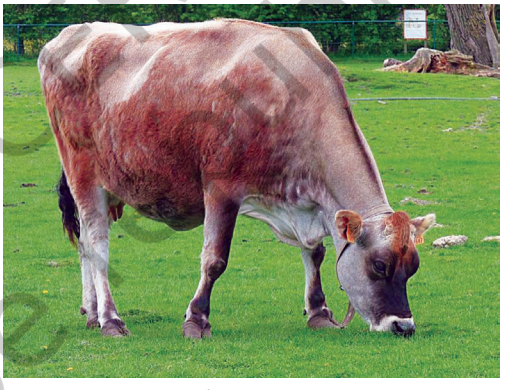
(d) Tharparkar

Fig. 2.2 (a–d): Indigenous cow breeds

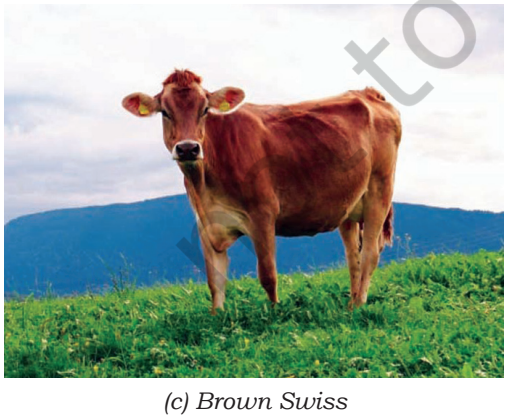
Table 2.2: Common Exotic Cow Breeds

S.No.	Breed	Country of origin	Colour	Average lactation yield (in 305 days)
1.	Holstein Friesian	Holland	Black and white	6100–6200 litres with 3.5% fat
2.	Jersey	Island of Jersey in the English Channel	Light brown with or without white patches on the body	4000–4500 litres with 5.5% fat
3.	Brown Swiss	Switzerland	Distinctly brown	5200–5400 litres with 4% fat
4.	Ayrshire	Scotland	Light to deep cherry red with or without white markings on the body	4800–5000 litres with 4.1% fat

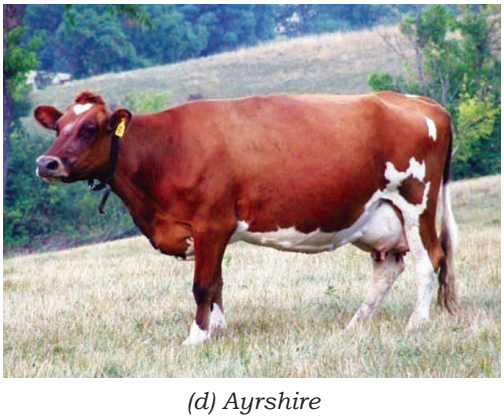
(a) Holstein Friesian



(b) Jersey



(c) Brown Swiss



(d) Ayrshire

Fig. 2.3 (a–d): Exotic cow breeds

Indigenous Buffalo Breeds

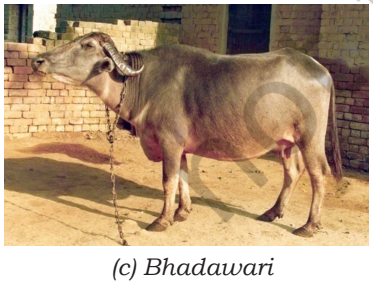
Buffaloes are found in almost all parts of India. They are the backbone of the dairy Industry as about half of the country's total milk is produced by them, even though their population is almost half to that of cows.

There are two type of buffaloes—swamp and river. Major buffalo population in India constitutes of the river type. Swamp buffaloes prefer marshy lands. They are predominantly found in parts of Assam, Nagaland, Manipur and Mizoram, and are of nondescript type. On the contrary, river buffaloes prefer clean water of rivers, irrigation canals and ponds. They are docile in nature and reared for milk with a high fat content.

The country is home to 13 indigenous buffalo breeds, like Murrah, Nili-Ravi, Surti, Mehsana, Jaffarabadi and Bhadawari (Table 2.3).

(a) Murrah

(b) Jaffarabadi



(c) Bhadawari

Table 2.3: Major Indigenous Buffalo Breeds

S. No.	Breeds	Habitat	Horn structure
1.	Murrah	Rohtak, Jind, Hisar, Bhiwani and Sonepat districts of Haryana	The horns are flat, short and spirally curved inwards.
2.	Nili-Ravi	Ferozpur district of Punjab	The horns are small and coiled.
3.	Surti	Kaira and Baroda districts of Gujarat	The horns are flat and sickle-shaped, forming a hook at the tip.
4.	Jaffarabadi	Kutch, Junagarh and Jamnagar districts of Gujarat	Animals have heavy horns, inclined to droop at each side of the neck, and then, turned up (drooping horns).
5.	Mehsana	Sabarkantha, Mehsana and Banaskantha districts of Gujarat	The horns are curled at the tip but not so much as in Murrah buffaloes. They are bigger than Murrah and sometimes of irregular shape.

6.	Banni	Kutch district of Gujarat	The horns are vertically upward with inverted single or double coils.
7.	Bhadawari	Agra and Etawah districts of Uttar Pradesh and Gwalior district of Madhya Pradesh	The horns are curled slightly outwards.
8.	Nagpuri	Nagpur, Akola and Amravati districts of Maharashtra	The horns are long and sword-shaped.
9.	Marathwadi	Beed, Parbhani, Jalna, Nanded, Latur, Hingoli and Osmanabad areas in Maharashtra	The horns are mostly rounded and short, located parallel to the neck and not extended beyond the hump.
10.	Pandharpuri	Solapur, Sangli and Kolhapur districts of Maharashtra	The horns are long, sword-shaped and sometimes twisted.
11.	Kalahandi	Eastern part of Andhra Pradesh and adjoining areas of Odisha	The horns are broad and slightly curved.
12.	Chilika	Surrounding areas of Chilika lake in Odisha	With age, the horns grow upwards, then lateral, and finally, form a typical sickle shape.
13.	Toda	Nilgiri Hills of Tamil Nadu	The horns are wide apart, curving inwards, and then outwards, forming a crescent shape.

(d) Surti

(e) Nili-Ravi

(f) Mehsana

(g) Nagpuri

Fig. 2.4 (a–g): Some important buffalo breeds found in India

Practical Exercise

Activity 1

Visit a large dairy farm in your area and identify the various breeds of cows or buffaloes housed there.

Material required

Cattle breed chart, writing material and PPE kit

Procedure

- Visit a large dairy farm in your area and talk to the farm manager or supervisor, seeking permission to take a round of the premises.
- Observe cows or buffaloes housed in the farm. Take note of their physical features and try to identify their breeds. You may take the help of farm workers.
- Write your observations in a notepad.
- Prepare a write-up based on your visit, experience and observations, and share it with the class. You may also use a breed chart to indicate the different cattle breeds as you share your presentation.

Activity 2

This may be a teacher moderated oral classroom activity. Charts, depicting the pictures of a cow and a buffalo, may be hung on a wall in the classroom. The teacher may ask the students to identify the animals' different body parts and spot the difference in the physical structure of the two animals.

Material required

Charts with pictures of a cow and a buffalo, and writing material

Procedure

- The teacher hangs the charts, depicting a cow and a buffalo on a wall in the classroom, and asks the students to identify the animals' body parts.
- The teacher then asks them to spot the difference in the physical structure of the two animals.
- One must see to it if the students are able to identify the hump and the dewlap in a cow, which are absent in a buffalo.

Check Your Progress

A. Multiple Choice Questions

1. Which of the following is not an exotic cow breed?
   (a) Jersey
   (b) Holstein Friesian
   (c) Tharparkar
   (d) Brown Swiss
2. Which of the following is a buffalo breed?
   (a) Murrah (b) Sahiwal
   (c) Tharparkar (d) Hariana

3. Where is the pole located in a cow?
   (a) In the base of the tail
   (b) In the flank region
   (c) Between two horns
   (d) None of the above
4. Hump and dewlap are found in _____.
   (a) Cows
   (b) Buffaloes
   (c) Both (a) and (b)
   (d) None of the above

B. Fill in the Blanks

1. _____ cows are developed by crossing indigenous and exotic cow breeds.
2. The _____ buffalo breed is found in Ferozepur, Punjab.
3. Holstein Friesian's country of origin is _____.
4. Brown Swiss is _____ in colour.

C. Mark 'True' or 'False'

1. Exotic cow breeds have higher milk production potential.
2. Exotic cow breeds are well-adapted to Indian conditions.
3. Jaffrabadi buffalo breed is found in Rajasthan.
4. Jersey is an indigenous cow breed.
5. Sahiwal is not an indigenous buffalo breed.

NOTES

Unit 3

Livestock Housing System I

17909CH03

A clean and comfortable housing protects dairy animals from various diseases and infections, and also ensures optimum milk production. The housing must be secured so that the animals do not fall prey to predators and thieves. In the absence of an appropriate accommodation, the animals are exposed to extreme temperatures and other climatic vagaries, which may adversely affect their health and productivity.

This unit discusses various aspects of housing for dairy animals, and appropriate and regular disposal of manure in order to maintain a hygienic, healthy and comfortable environment in a farm.

Session 1: Basics of Animal Housing

An appropriately-planned housing is important for the efficient management of dairy animals.

Key aspects of animal housing

Some of the important aspects that must be taken care of while planning a housing facility for dairy animals are discussed in the following sections.

Fig. 3.1: Purposes of animal housing

Space

One must ensure that the animal shelter is sufficiently spacious, allowing the animals to move around freely, and giving them easy access to feed and water.

Feed

Arrangements for feed and fodder for the animals must be made in the housing area itself. A dairy worker must keep an eye on the daily intake of feed by each animal living in the farm or shelter.

Water

Drinking water arrangements for the animals must be made in the shelter itself. Besides, the dairy worker must see to it that the animals are made to drink sufficient water at regular intervals throughout the day. This helps in maintaining their normal body temperature.

Ventilation

The animal shelter must be ventilated. Ventilation ensures air exchange (fresh air in, stale air out) and distribution. It ensures maintenance of adequate temperature and humidity levels, apart from expelling odours, gases and pathogens.

Light

A dairy worker must inform the dairy farmer in case an animal shelter does not get abundant natural light. The worker must see to it that the animal shelter gets abundant natural light, while also maintaining six hours of darkness. It helps to ensure optimum milk yield from the animals housed there.

Fig. 3.2: Cows relaxing on straw bedding in the resting area of a farm

Resting area

One must see to it that there is sufficient dry and comfortable space for the animals to rest for at least 13 hours a day. Feed and water are restricted in this area. Fig. 3.2 shows a resting area, where straw has been used as bedding material.

Types of livestock housing

The housing system for livestock may be classified into the following categories (Fig. 3.3).

Loose housing system

Such housing layout has an open area or paddock and a resting area. The open area has a covered shed on one side for the animals to rest. In this housing system, a group of 40–50 animals are kept in an

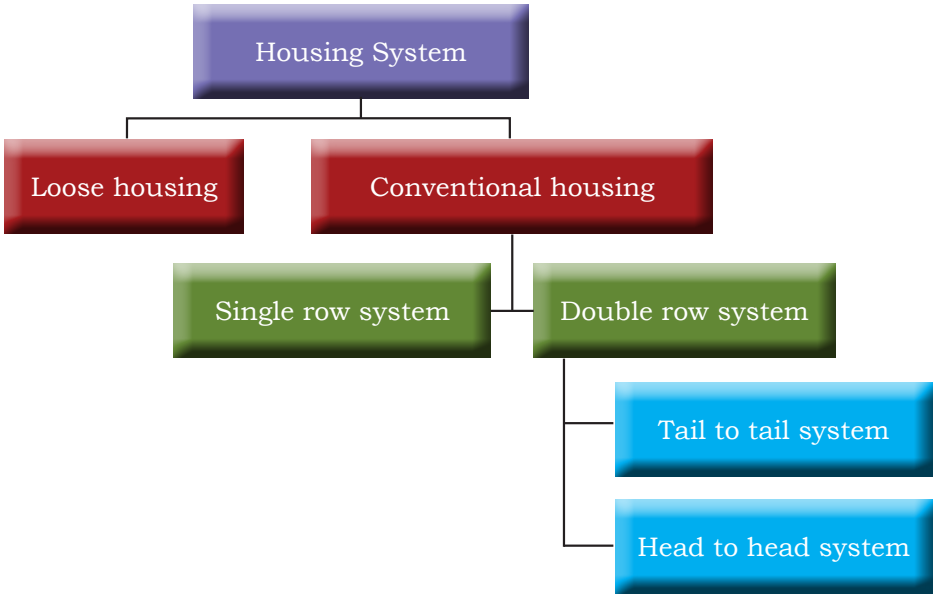


Fig. 3.3: Types of livestock housing

open paddock throughout the day and night, except during milking hours and for some other specific purposes like treatment, breeding, etc. The housing system consists of a separate milking parlour and a milk room as well. Feed and fodder is offered to the animals in a common manger. Drinking water is provided to the animals in common water troughs. The area is protected by a compound wall or fencing, which is at least 5 feet high. This system is

Fig. 3.4: Loose housing system with a covered and an open area

Fig. 3.5: Buffaloes kept in a loose housing system eating from a common manger

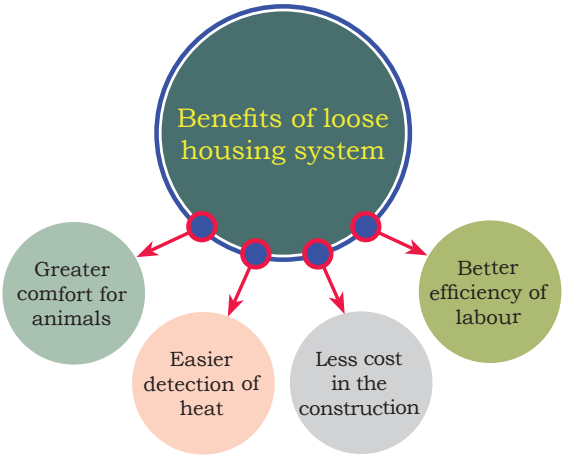


Fig. 3.6: Benefits of loose housing system

ideal for areas receiving low rainfall, such as Punjab, Haryana, Rajasthan, western Uttar Pradesh, and parts of Gujarat, Madhya Pradesh and Maharashtra.

Conventional housing system

In this system, the animals are tied in a shed for feeding, watering, milking and resting. The barns are roofed and have windows for ventilation. The distance between two sheds is at least 30 feet. Feed is offered to each animal in a trough. The animals are milked individually. The manure is collected in a gutter. This type of housing is appropriate for temperate regions, as it protects the animals from heavy snowfall, rains and chilly winds. Such barns provide better protection to the animals during winters. However, there are a few disadvantages of such a housing system, for example, if the cattle are tied throughout the year, their feet become stiff, which could lead to feet-related problems. Also, it is difficult to detect 'oestrus' (a recurring period of sexual receptivity and fertility) in female cattle.

Single row system

Such an arrangement depends on the number of animals to be accommodated in a shed. Single row system is appropriate for housing up to 10 animals. When the number of animals exceeds 10, double row system is preferable.

Double row system

In such an arrangement, the animals either face away from each other (tail to tail) or face towards each other (head to head).

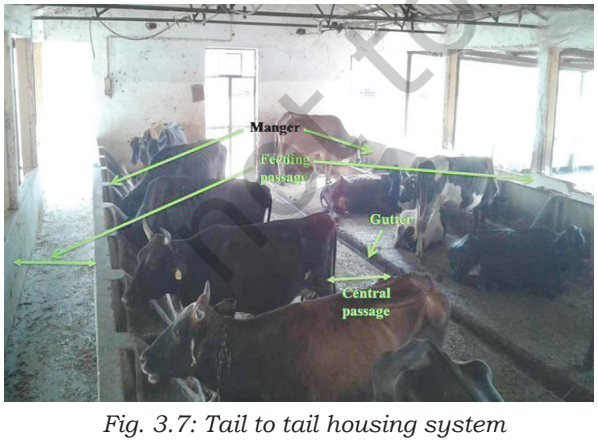


Fig. 3.7: Tail to tail housing system

Tail to tail system

In this system, the animals are tied in the opposite direction, i.e., their tails facing each other. Each animal is provided with a separate manger for feed and fodder. Such an arrangement makes it easier for a dairy worker to clean the sheds and milk the cattle. Moreover, chances of disease and infection transmission from animal to animal are reduced. In such an

arrangement, it is easier to detect problems in the hindquarters of the animals than in loose housing system. As the area is ventilated, the animals get abundant fresh air. The milking process can also be effectively supervised in this system.

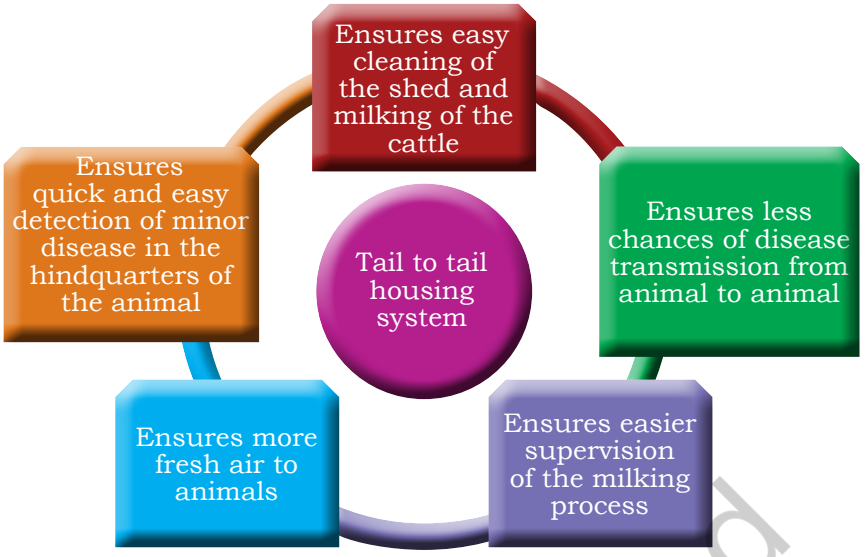


Fig. 3.8: Benefits of tail to tail housing system

Head to head system

In this system, the animals are tied in such a way that they stand facing each other, making it easier and comfortable for them to eat. The gutter, where the dung is collected, is the area that gets the maximum morning sunlight, which improves the overall hygiene of the shed. This housing system ensures better livestock management.

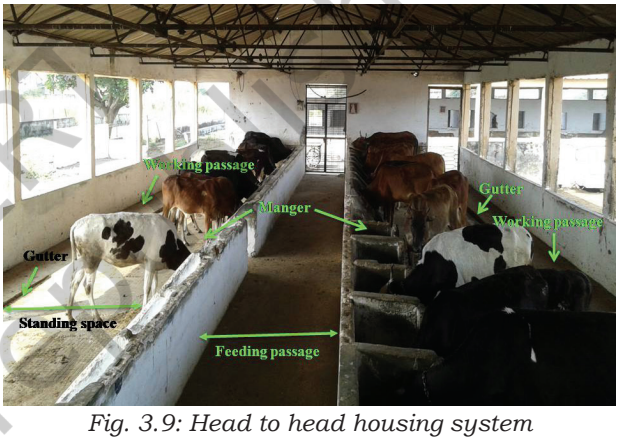


Fig. 3.9: Head to head housing system

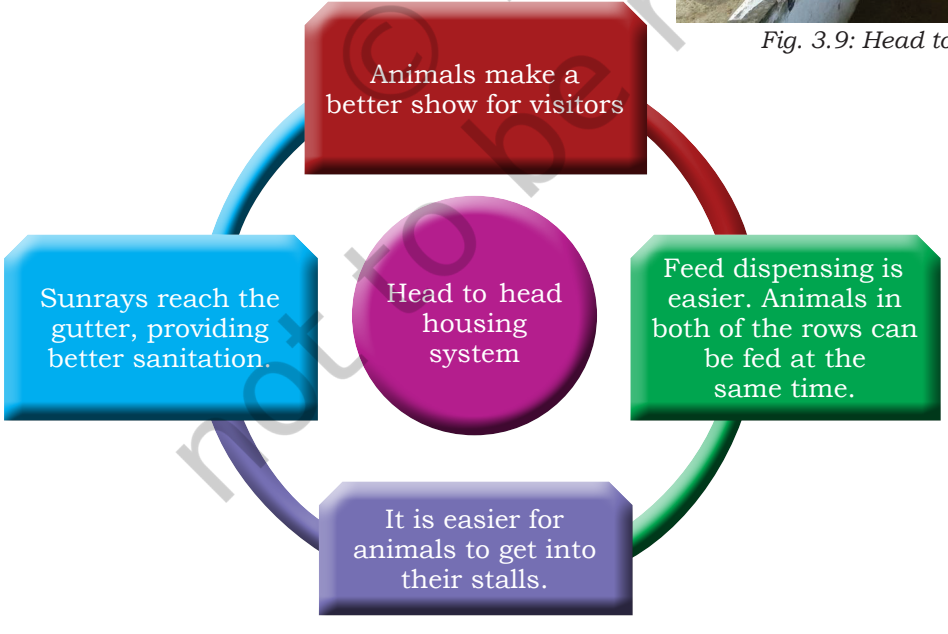


Fig. 3.10: Benefits of head to head housing system

Practical Exercise

Activity

Visit a nearby dairy farm and examine its housing design.

Material required

Writing material and PPE kit

Procedure

- Visit a nearby dairy farm and visit the animal shed.
- Note the various structures set up there.
- Draw an outline of the dairy farm and identify its housing layout or system.
- Prepare a write-up based on your observations and experience, and share it with the class.

Check your Progress

A. Multiple Choice Questions

1. Loose housing system is suitable for which of the following states?
   (a) Punjab
   (b) Goa
   (c) Kerala
   (d) Lakshadweep
2. The ideal number of animals to be kept in a paddock is _____.
   (a) 10–20
   (b) 40–50
   (c) 100–150
   (d) 1000
3. Which of the following is not a purpose of animal housing?
   (a) Providing clean and comfortable environment
   (b) Reducing the possibility of diseases and infections
   (c) Protecting the animals from theft and predators
   (d) Making the animals idle
4. Double row system of housing system comprises _____.
   (a) head to head system
   (b) tail to tail system
   (c) Both (a) and (b)
   (d) None of the above

B. Fill in the Blanks

1. A loose housing system has an _____ and a _____ area.
2. Conventional housing system is divided into two types. They are _____ and _____ row systems.
3. The conventional housing system is more suitable for _____ regions.
4. In _____ system, dairy animals are tied in the opposite direction to each other.

Session 2: Equipment and Machinery Required in a Dairy Farm

The equipment and machinery required in a dairy farm depend on its size, type and number of animals inhabited there. Some of the major equipment required for a small and medium-sized dairy farm are feed grinder, feed mixer, cooling and heating unit, generator set, milking machine and utensils, weighbridge, electrical dehorner, burdizzo castrator, tagging set, branding numbers, drenching bottle, hoof trimmer, ropes, fire extinguishers, chains, chaff cutters, etc.

If a farm is located in an area that faces extreme weather conditions, then it must have cooling and heating units, and a generator set as well. In case the number of dairy animals exceeds 50, then a generator set, milk cooling appliances and a utility vehicle are required. If a farm houses a large number of animals, then it must have an area dedicated to fodder cultivation. Thus, farm equipment like tractor, and sowing, harvesting and processing equipment are also needed.

Some of the equipment, tools and machinery required for a small and medium-sized dairy farm are as follows (Table 3.1).

Table 3.1: Common Equipment, Tools and Machinery Required in a Dairy Farm

Section	Equipment, tools and machinery
Fodder production	Tractor
	Trolley
	Large weighing bridge
	Fodder reaper-cum-binder
Feed processing	Chaff cutter (manual or motor operated)
	Feed grinder
	Feed mixer
Dairy section	Cooling system
	Heating system
	Generator
	Motor operated tube well
	Milking machine
	Animal weigh bridge
	Electrical dehorner
	Burdizzo castrator
	Tagging set
	Branding numbers

	Drenching bottle
	Hoof trimmer
	Ropes, fire controlling equipment, iron chains, etc.

Some of the common machinery and equipment used in a dairy farm are shown in Fig. 3.11 (a–j).

(a) A platform type electronic weighbridge is used to measure the weight of an animal.

(b) A bull leader is used for controlling bulls in a farm

(c) An electrical dehorner is used for disbudding the horns of young calves.

(d) A metal drenching bottle is used for administering medicines orally to animals.

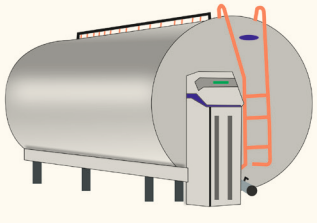
(e) A bull nose ring is inserted into the nasal septum of a bull to control the animal.

(f) Ear tags and tag applicator are used for tagging the animals for easy identification.

(g) Branding numbers are used for branding the animals for easy identification.

(h) A burdizzo castrator is used for castrating male calves.

(i) A hoof trimmer is used for trimming the hooves of animals.



(j) A bulk milk cooler is used for cooling the milk just after it is milked.

Fig. 3.11 (a–j): Common machinery and equipment used in a dairy farm

Other essential provisions in a dairy farm

Some of the aspects that need to be taken care of in an animal shelter are discussed in the sections below.

Floor

The floor of the shed must be constructed with impervious and non-slippery material, like bricks, cement, concrete, etc., that may be cleaned and dried easily. Besides, there must be sufficient floor space to ensure animal comfort. Inadequate space causes overcrowding of the animals, leading to abnormal behaviour, decreased body weight and drop in their overall performance, including milk yield. Table 3.2 shows the floor space requirement for dairy animals.

Table 3.2: Floor Space Requirement for Cattle as per BIS*

Animal	Floor space require (m^2)		Maximum no. of animals in each group	Height of shed at eaves
	Covered area	Open area		
Cow	3.5	7	40	175 cm in case of medium and heavy rain area, and 220 cm in semi-arid and arid areas
Buffalo (female)	4	8	40	
Bull	12	24	1**	
Down calver	12	12	1	
Calf (below one year)	1	2	30	
Young animal (aged over one year)	2	4	30	

**Bureau of Indian Standard*
Note: Breeding bulls are housed and fed separately

Manger and water trough

To ensure optimum productivity (milk yield), the animals must be housed in spacious and clean shelters, where they have easy accessibility to feed and water round the clock. The water troughs must be located near the feeding area and seldom in the resting area. Mangers and water troughs must be made of reinforced cement concrete, brick with cement mortar, or stone slabs with cement joints. A manger must have smooth surface so that the animals can eat the feed easily. Besides, it ensures easy cleaning of the manger. Water depth in

troughs must be maintained at a minimum of 3 inches so that the animals are able to submerge their muzzle for up to 1 to 2 inches and drink water comfortably.

Feeding and watering space requirement for different type of animals are given in Table 3.3.

Table 3.3: Feeding and Watering Space Needed in a Paddock

Animal	Linear length (m) per animal	Total manger length (m) per 100 animals	Water trough length (m) per 100 animals	Dimensions of manger or water trough		
				Height (m) of wall	Depth (m)	Width (m)
Adult cows and buffaloes	0.6–0.7	60–75	6–7.5	0.6	0.4	0.5
Calves	0.4–0.5	40–60	4–5	0.4	0.15	0.2

Practical Exercise

Activity

Visit a nearby dairy farm and identify five machines and equipment being used there.

Material required

Writing material and PPE kit

Procedure

- Visit a nearby dairy farm and observe workers carrying out different dairying activities.
- Note at least five machines and equipment they use to carry out the activities.
- Draw the diagram of the equipment or machines that you are able to identify.
- Write the use of each equipment and machine based on your observation.
- Prepare a write-up and give a presentation before the class.

Check your Progress

A. Multiple Choice Questions

1. A bulk milk cooler is used to cool the milk _____.
   (a) just after milking
   (b) before despatching it to customers
   (c) 72 hours after milking
   (d) None of the above

2. A hoof trimmer is used for _____.
   (a) trimming the horns
   (b) trimming the tail hair
   (c) trimming the hooves
   (d) None of the above
3. The flooring for an animal housing must be constructed with _____.
   (a) marble stone
   (b) wood
   (c) ceramic tiles
   (d) bricks
4. A burdizzo castrator is used for _____.
   (a) dehorning
   (b) castration
   (c) branding a number on an animal
   (d) None of the above

B. Fill in the Blanks

1. The linear length for feeding an adult animal from a manger is _____ to _____ metres.
2. Calves need _____ space for feeding and drinking than adults.
3. A _____ is inserted into the nasal septum of bulls in order to control them.
4. The floor space requirement for cows and buffaloes in the open area is _____ than in covered area.

C. Mark 'True' or 'False'

1. A burdizzo castrator is used for detecting oestrus in cows.
2. An electrical dehorner is used for disbudding the horns of young calves.
3. A bull leader is used for controlling cows.
4. A drenching bottle is used for feeding the calves.

SESSION 3: ROUTINE ACTIVITIES IN A DAIRY FARM

Dairy farming is a 365 days long all-weather activity. A number of activities and operations are carried out at a dairy farm daily, monthly, quarterly or yearly (Table 3.4). Some of these activities include milking; cleaning of sheds, mangers and milking utensils; feed preparation and distribution; treatment of animals; heat (oestrus) detection and artificial insemination; etc.

Table 3.4: Routine Activities Carried Out at a Dairy Farm

Periodicity	Activities
Daily	Milking
	Cleaning of sheds
	Cleaning of mangers
	Cleaning of milking utensils
	Feed preparation
	Feed distribution
	Routine treatment of animals
	Heat or oestrus detection
	Artificial insemination
	Checking stock balance
	Recording and maintenance of data of different farm operations
Monthly	Cleaning and painting water troughs
	Thorough cleaning of the farm premises
	Checking all farm implements, tools and machinery for damages and repair
	Oiling, and greasing implements and machinery being used in the farm
	Carrying out small repair works in the farm
Quarterly or yearly	Vaccination of animals
	Deworming of animals
	Carrying out major repair works in the farm

Model daily routine at a medium-sized farm

Dairy animals housed at farm follow certain daily routine activities. Deviation from this may cause stress to the animals and even lead to abnormality in their behaviour, which in turn, may adversely affect their productivity. Most activities like cleaning (the animals and their sheds), feeding, milking and treatment have to be completed the same day, which consume the maximum time of a dairy worker. Therefore, scheduling of dairy farm operations is essential. Table 3.5 depicts the model daily routine schedule of a medium-sized farm inhabiting 50 animals.

Table 3.5: Daily Routine Schedule at a Medium-Sized Farm

Approximate time (hours)	Farm operations	Material required
04:00–04:30	• Cleaning/brushing of milch animals	• Hose pipe • Water supply • Grooming brush
04:30–06:00	• At the time of milking, animals are offered half of the daily concentrate mixture required for milk production • Milking of animals	• Concentrate mixture • Measuring appliances • Towel • Milking bucket • Post-milking teat dips
06:00–06:30	• Delivery of raw milk (in cans) to the milk vendors	• Milk storage container
	• Washing and disinfection of milking barns	• Hose pipe • Water supply • Disinfectants
06:30–08:00	• Cleaning of animal shed and paddock	• Hose pipe • Water supply
	• Cleaning farm premises	• Hose pipe • Water supply • Broom
	• Isolation of sick animals	• Rope
	• Isolation of 'in-heat' cows for artificial insemination	• Rope
08:00–11:00	• Cleaning of calf pen, calving box, dry stock and bull shed	• Broom • Disinfectants
	• Feeding of dry/green fodder	• Dry/green fodder • Feed distribution trolley or tractor
	• Feeding half of the daily concentrate mixture to calves, heifers, pregnant cows and bulls	• Concentrate mixture • Feed distribution trolley

Fig. 3.12: Dirty back of a cow

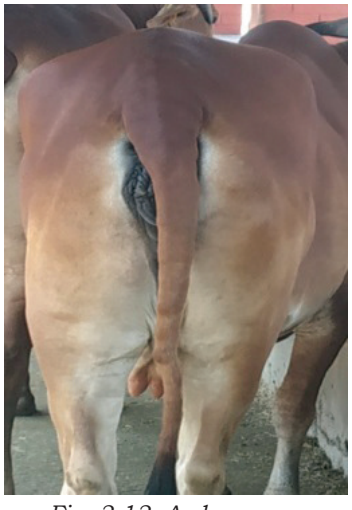


Fig. 3.13: A clean cow (after washing)

	• Treating sick animals	• Isolation shed • Medicines
	• Breeding cows which are in heat	• Material required for artificial insemination
	• Harvesting, chaffing and feeding of green fodder to all the stock	• Chaff cutter • Feed distribution trolley or tractor
11:00–14:00	• Lunch-cum-rest period for labourers	
14:00–14:30	• Miscellaneous jobs of dairy farm like animal identification, preparation of concentrate mixture, repair of farm fences, fittings and repair of equipment, rope and halter making, weekly scrubbing and whitewashing of water trough, manure disposal, periodical deworming of different categories of animals, weighing of animals, clipping hair as per requirement, grooming, hoof trimming, etc.	
14:30–15:30	• Washing/brushing of milch animals by milkers	• Hose pipe • Water supply
15:30–16:30	• At the time of afternoon milking, animals are offered half of the daily concentrate mixture required for milk production • Milking of animals	• Concentrate mixture • Measuring appliances • Towel • Milking bucket • Post-milking teat dips

	• Cleaning calf pen, calving box, dry stock and bull sheds • Feeding rest other half of concentrate mixture ration to calves, heifers, pregnant cows and bulls	• Hose pipe • Water supply • Broom • Concentrate mixture • Feed distribution trolley
	• Feeding of dry/green fodder to milch stock	• Dry/green fodder • Feed distribution trolley or tractor
16:30–17:30	• Delivery of milk (in cans) to milk vendors	• Milk storage container
	• Washing and disinfections of milking barns	• Hose pipe • Water supply
	• Feeding dry and green fodder to calves, heifers, dry stock and bulls	• Dry/green fodder • Feed distribution trolley or tractor
17:30–18:30	• Cleaning of milch cattle shed	• Hose pipe • Water supply
	• Feeding green/ dry fodder to milch cattle	• Dry/green fodder • Feed distribution trolley or tractor
	• Cleaning farm premises	• Hose pipe • Water supply • Broom
18:30–04:00	• Night watchman on duty	

Fig. 3.14: An unclean paddock

Fig. 3.15: Dairy workers cleaning a paddock

Practical Exercise

Activity 1

Visit a dairy farm in your area and note the dimensions of housing structures constructed there.

Material required

Measuring tape, PPE kit and writing material

Procedure

- Visit a nearby dairy farm and request the farm supervisor to allow you to visit the various facilities constructed in the farm.

- Measure the dimensions of various sheds and other structures built in the farm and note these in a notebook.
- Also, write the total number of animals housed in the farm and the number of workers employed there to take care of the animals.
- Prepare a write-up based on your observations and present it before the class.

Activity 2

Visit a nearby dairy farm in your area and prepare a write-up about the daily routine activities being carried out there.

Material required

PPE kit and writing material

Procedure

- Visit a nearby dairy farm in your area in the morning. Try to stay there till the evening—the time when all animals retire to their sheds to rest.
- Take a note of all activities being carried out in the farm along with the respective time.
- Talk to the farm supervisor about the daily activities carried out in the farm. Also, note the activity that you missed seeing.
- Prepare a write-up based on your observations and share it with the class

Check Your Progress

A. Fill in the Blanks

1. Cleaning of mangers is a _____ routine.
2. Thorough cleaning of the farm premises is done on a _____ basis.
3. Vaccination and deworming of animals is carried on a _____ basis.
4. It is necessary to milk the animals _____.

B. Mark 'True' or 'False'

1. Heat detection of animals is not a daily routine activity.
2. At the time of milking, milch animals are offered half of daily concentrate mixture required for milk production.
3. It is necessary to thoroughly clean and brush an animal before milking.
4. It is not necessary to exercise and groom the bulls on a daily basis.

Unit 4

Livestock Housing System II

17909CH04

An appropriately designed shelter is important for ensuring animal comfort and protection (from extreme weather conditions like heat, rain, wind and cold, and predators and thieves). Beside, it leads to optimum milk production. Therefore, a dairy farmer must see to it that an animal shelter is designed in such a way that animals of all age groups are accommodated separately. Besides, the animal shelter must facilitate safe and smooth discharge of various farm operations like milking, feeding, cleaning, etc., at the same time. An animal house must be constructed on certain principles as shown in Fig. 4.1.

Layout of Animal Housing

A dairy herd is divided into groups, especially in case of a large farm. The grouping of the animals is done on the basis of their nutritional and operational requirements. Dairy animals may be categorised as heifers, lactating cows or buffaloes (in the early, mid or late stage of lactation), dry cows or buffaloes, advanced pregnant cows or buffaloes, sick animals, breeding bulls, or suckling and young calves. Appropriate grouping of

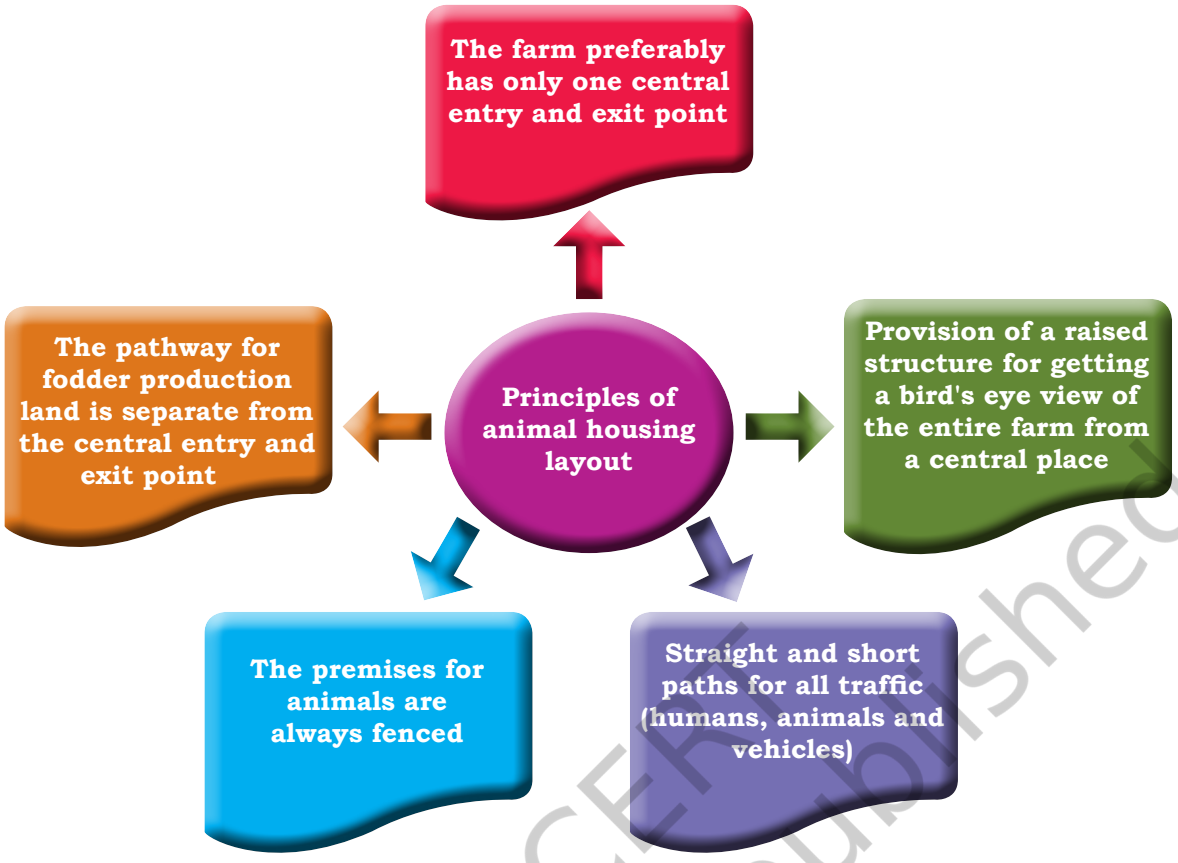


Fig. 4.1: Principles of constructing an animal house

animals reduces incidences of animal fights, enabling better management of farm operations.

A dairy farm has different sections like separate sheds for milch animals, dry animals, heifers, calves, bulls and sick animals; calving pen; milking parlour; artificial insemination unit-cum-veterinary dispensary; etc. Some ancillary structures found in the farm are chaffing shed, handling yard, manure disposal area, silo, travis, wallowing tank, milk receiving room, milking utensil(s) storage room, implements and workshop shed, and fertiliser and fodder seed storage room. The layout plan of a large dairy farm as per the Bureau of Indian Standards (BIS) is shown in Fig. 4.2.

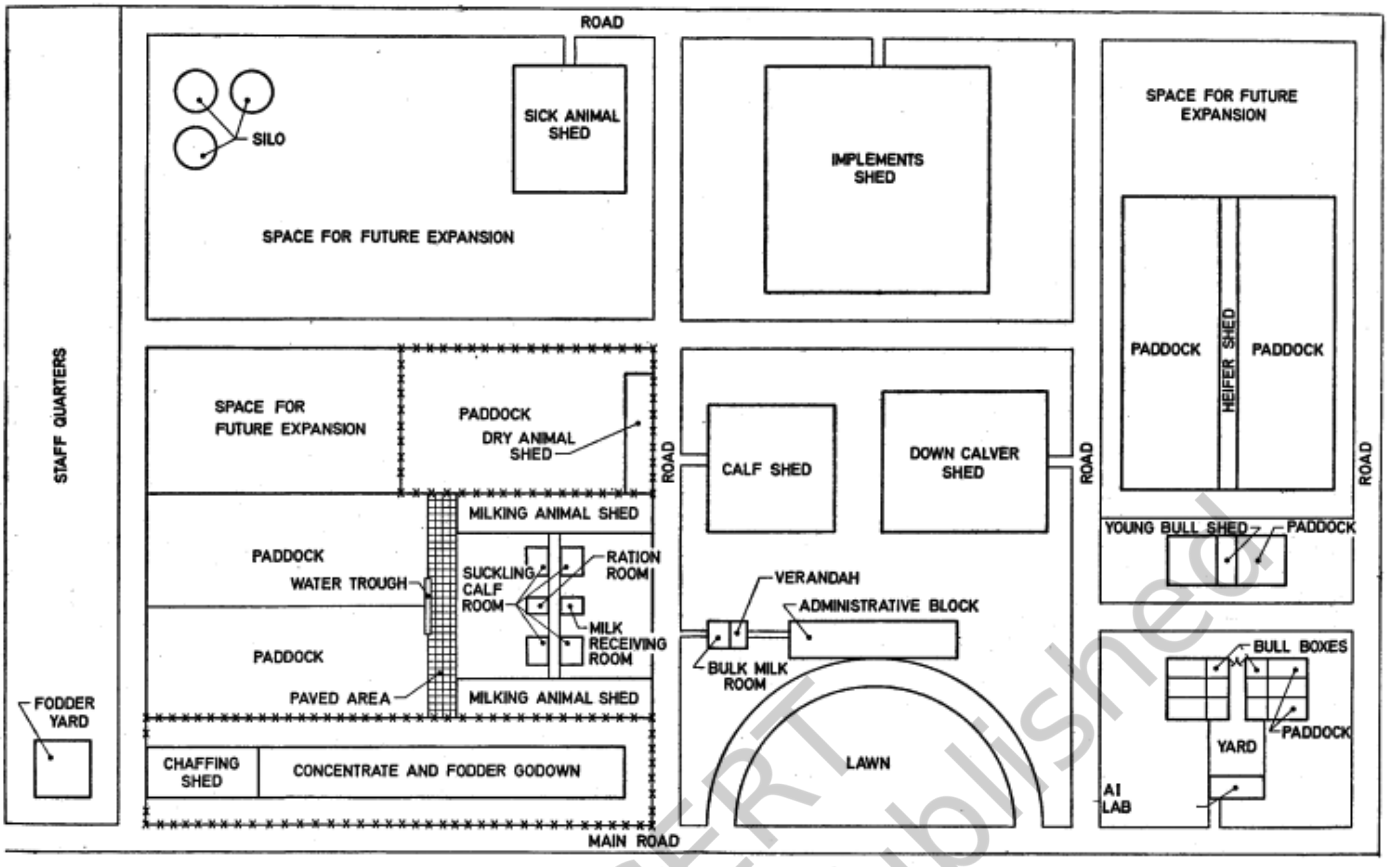


Fig. 4.2: Layout plan of a large dairy farm as per the Bureau of Indian Standards

Important Sections of a Large Dairy Farm

A large dairy farm has three important sections—cattle, dairy and fodder production. The various structures associated with these sections are shown in Table 4.1.

Table 4.1: Important Sections of a Large Dairy Farm

Cattle section	Animal sheds	Milch animal shed
		Dry animal shed
		Calving box or calving pen
		Heifer shed
		Calf shed
		Bull shed
		Milking parlour
		Sick animal shed and veterinary dispensary
	Ancillary structure	Artificial insemination
		Concentrate mixture godown storage

		Dry fodder godown or storage
		Chaffing shed
		Handling yard
		Manure disposal area
		Silo
		Travis
		Wallowing tank
Dairy section		Milk collection room
		Storage room for milking utensils
Fodder production section		Implements and workshop shed
		Storage rooms for fertiliser and fodder

Cattle section

This is the most important section in the farm. It has various units, planned in a way to provide comfort and protection to the animals housed there, and also render operational convenience to the farm workers.

Animal sheds

Milch animal shed

The length and width of the floor area of the shed is decided on the basis of the average size of the animals that are to be housed there. The per animal floor space requirement may vary from 1.5 to 1.7 metres in length and 1 to 1.2 metres in width. The width of the central passage may be 1.8 metres. The central passage has a slope in such a way that the central axis is 25 mm in height, which gradually decreases to 1 mm towards both the sides. In tail to tail system, there are two drains on either side of the central passage. There are two continuous mangers on the outer side of the area.

Dry animal shed

Dry animals may be housed in a loose housing set-up. Such an accommodation consists of a centrally placed manger under a roof in a paddock. The manger must be surrounded by a 2.2 metre wide paved platform with drainage.

Milking parlour

Milch animals, living in the farm, are milked in this area. After milking, the animals are taken back to the feeding or resting area. The milking parlour is usually a part of a larger complex called the 'milking centre'. The floor space requirement per cow or buffalo in a milking parlour is 1.7×l.2 m. The milking parlour consists of the facilities discussed in the following sections.

Fig. 4.3: A milking parlour

Holding area

It is a paved area just outside the entrance of the milking parlour to hold the animals till they are to be milked. It may be open or covered. The space requirement for the holding area is about 15 square feet per animal. The slope of the holding area is opposite to the entrance of the milking parlour.

Milk room

It is used for storing milk, milking utensils and related equipment. The milk is cooled, cleaned and pasteurised here.

Utility room

Equipment like vacuum pumps, refrigeration compressors and water heaters are stored in this room.

Calving pen

Cattle like to live in herds, but they prefer a quiet place away from the disturbance of the herd and farm workers at the time of giving birth. After calving, the animals need to be with their calves to build a bond. In conventional housing system, the animal, usually, remains in the same barn after giving birth. However, in loose housing system, it is isolated from the herd and kept in an individual calving pen, measuring 12 square metres. The animal is transferred to the calving pen two to three weeks before calving. It stays there for three to five days after calving. Generally, there is one calving pen for every 20 animals, i.e., 5 per cent of the breeding females. The floor of the calving pen is made of

non-slippery material and each pen is connected to a drain. The covered and open areas of a calving pen are shown in Fig. 4.4 (a) and (b), respectively.

Fig. 4.4 (a): Covered area of a calving pen

Fig. 4.4 (b): Open area of a calving pen

Calf shed

Newborn calves are housed individually for the first eight weeks, after which they are placed in the group housing system. Since a calf is susceptible to catching infections, the death rate is the maximum in the initial weeks. Therefore, special attention must be paid to hygiene. After individual housing, calves are placed in group housing. Calves aged below one year may be grouped into three categories—up to 3 months, 3–6 months and over 6 months, and housed accordingly. The floor space requirement for each calf aged below 3 months is about 20–25 square feet and 30 square feet for those aged 3–6 months.

Heifers Shed

A heifer is young female dairy animal aged over one year until first calving. It is housed in an area measuring 30–40 square feet. Heifers are housed separately from young males to prevent undesirable mating.

Bull shed

Breeding bulls are always kept in individual pens to allow free movement. A bull must have free access to an exercise yard having a 4 feet high strong fence or

boundary wall. A shed for bulls has mangers and a water trough. From its shed, the bull can see other animals of the herd and hence, does not feel isolated.

Fig. 4.5: A bull shed

Sick animal shed and veterinary dispensary

Sick animals are sheltered away from a shed meant for healthy animals in order to check the transmission of diseases and infections (from sick to healthy animals). Each sick animal is housed in an individual pen in the sick animal shed. The dimensions of the shed are similar to the calving pen. The paddock of the shed is paved and washed regularly. A travis is placed in one corner of the paddock. For the treatment of sick animals, the shed has a separate room, measuring 3×4 square metres, with a dispensing counter, shelves, sink, power plugs and cupboards.

Isolation yard

Animals suffering from infectious diseases are separated from the rest of the herd. The number of isolation yards depends on the size of the herd. Usually, there is a provision of at least one isolation yard (measuring 5×3 square metre) for every 40 animals. However, it depends on the size of the farm, and the number and size of the animals sheltered there. One isolation yard can accommodate two to six animals, depending on their size. The shed must have a fly-proof wire netting door and an independent drain. It must be located at an appropriate distance from other sheds.

Ancillary structures

The other structures important for carrying out day-to-day farm operations are called 'ancillary structures'. Few such structures include Artificial Insemination (AI) laboratory, concentrate and dry fodder godown, ration room, chaffing shed, wallowing tank, etc. The size and number of ancillary structures

Fig. 4.6: An AI laboratory at a dairy farm

Fig. 4.7 (a): A travis

Fig. 4.7 (b): A cow inside a travis

depend on the type and size of the herd. Some of the major ancillary structures that a farm must have are discussed in the sections below.

Artificial Insemination (AI) laboratory

Located adjacent to the bull shed is a 10×10 square metre service yard with a service crate for collecting semen of the bulls housed in the farm. The AI laboratory is attached to the service yard, where testing, processing and storage of semen is carried out. The minimum dimensions for an AI laboratory are 3×4 square metres.

Travis

It is a U-shaped structure made of galvanised steel pipes, measuring 2 inches in diameter and supported by five or seven pillars. One horizontal pipe is welded on the sides across the two rear pillars to protect workers working there from side leg kicks by animals brought for treatment or AI. An adjustable pipe is put across rear two pillars through clamps fixed on both sides to prevent an animal from going out of the travis. One iron ring is provided at the top of the front pillar for tying the animal and prevent it from jumping off.

Storage of fodder

Dry fodder (like hay) and agricultural by-products (like straw) are fed to the animals daily. Adult and young animals consume

about 6 kg and 3 kg of dry fodder per day, respectively, apart from green fodder and concentrates. Therefore, a dairy farm must have a godown(s) to store concentrates and dry fodder. The godown must be moisture free. It must also be rodent proof. Usually, concentrate can be stocked for three months and dry fodder can be stocked (wheat straw) for the entire year in the godown. The size and type of godown depends on the quality and quantity of feed and fodder that need to be stored there. For storing one quintal grains and straw, an area of 0.17 and 3 cubic metre, respectively, is required.

Fig. 4.8: A dry fodder godown at a dairy farm

Fig. 4.9: Concentrate bags kept in a ration room at a farm

Ration room

This facility is mostly found in a medium-sized farm. A ration room in a medium-sized farm is usually of the size 3×4 metres. Located near the milking shed, it is used for storing concentrates for the animals. The ration room must be moisture free. Besides, it must be rodent-proof.

Chaffing shed

It is the place where a chaffing machine is used for cutting grasses and green fodder into small pieces that may be fed to the animals. The process of chaffing improve the palatability and digestibility of the fodder. The floor of the chaffing shed is made of cement concrete. A chaffing shed floor area is usually of the size 14×4 metres. A chaffing shed consists of two parts—one for storing the fodder to be chaffed, and the other for storing the chaffed material.

Silos

Fresh green fodder is rich in nutrients. The nutritive value depletes when the fodder is dried. The nutritive quotient of green fodder is maintained through the

process of silage. Silage helps to preserve green fodder for cattle consumption. The importance of silage is realised by a dairy farmer, especially during shortages. Silos are structures meant for storing silage. These are preferably built near animal sheds. They are constructed on an elevated ground to provide sufficient amount of silage to the animals housed in the farm during May to June and October to November, when green fodder is in short supply. Quality silage weighs 0.40 to 0.48 tonne per cubic metre. The average daily requirement of silage for an adult cow or buffalo is 10–13 kg.

Wallowing tank for buffaloes

The word, 'wallowing', means rolling or lying in mud or water to cool the body. Buffaloes are often seen wallowing in a pond or mud especially during summers. Buffaloes may wallow for up to five hours at a stretch during summers. One can often notice buffaloes submerging themselves completely into water, except the nostrils, and chewing with half closed eyes. Buffaloes experience summer stress due to hot weather as they have dark skin, sparse hair and less number of sweat glands. Besides cooling, wallowing helps in removing ectoparasites and other pests from their bodies. Therefore, it is important to have a wallowing tank in a buffalo farm. A wallowing tank, measuring 40×60 ft, can accommodate about 100 adult buffaloes at a time. The water of the wallowing tank must be changed every week.

Fig. 4.10: A herd of buffaloes in a wallowing tank

Manure disposal area

Animals defecate approximately 8 per cent of their total body weight daily. Therefore, large quantities of urine, leftover feed and fodder, bedding material, etc., are produced in a livestock farm daily. A farm worker often mixes animal excreta with straw, which may later be used as fertiliser. Hence, appropriate storage of manure

is an important part of manure management. Cattle manure is removed at least twice a day and disposed either in solid or liquid form (slurry).

Table 4.2: Daily Manure Output of Farm Cattle

Animals	Manure output (kg)	Dry matter content (%)
Cows	30–35	18–20
Buffaloes	35–40	16–18

Manure and compost pit

It is located at a distance from animal sheds in order to check foul smell and infestation. However, it need not be constructed very far as it would require more labour for transporting manure. The manure pit is cleared every 6 to 8 weeks.

The manure is transported to a compost pit or a vermicompost unit. The dimensions of a compost pit are 4×2×1 metre. Earthworms are used to convert solid waste into vermicompost.

Liquid manure disposal

The mixture of dung and urine is called 'slurry'. Manure with less than 20 per cent solid content possesses the consistency of thick slurry, which may be directly disposed into fields or by pumping.

Casting pit

It is the area, where the animals are made to recline for treatment or other veterinary purposes. A casting pit is usually 0.31 metre deep and 2.4 metre high, and has a diameter of 7.62 metre. It contains about 15 cm sand, sawdust or a mixture of both, which serves as a comfortable bedding material for the animals.

Fig. 4.11: A casting pit

Dairy section

The main aim of a dairy farm is to produce optimum milk. Therefore, appropriate arrangements need to be made to ensure hygienic handling, processing and disposal of milk. The dairy section comprises the components discussed in the sections below.

Milk receiving room

Collection of milk is an important activity in the day-to-day operations of a dairy farm. After milking the animals, the milk is collected, weighed and stored in cans for a short duration in the milk receiving room. From here, it is transported to the bulk milk room and finally reaches milk plants or markets. The room is usually located near the milking parlour. The doors and windows of the milk receiving room are made fly-proof to ensure hygienic storage conditions. The flooring is impervious and wear-resistant. The dimensions of a milk receiving room depend upon the quantity of milk handled daily. A large farm generally has a milk receiving room, measuring 3×4 metres.

Fig. 4.12: Refrigeration facility at a bulk milk room in a farm

Bulk milk room

Milk from the milk receiving room is transferred to the bulk milk room in cans. The milk cans are placed here in insulated tanks filled with refrigerated water. To check bacterial growth and prevent spoilage, the temperature of the milk is maintained at around 4–5° C. A large dairy farm has a separate bulk milk room. It usually measures 4×5 metres. However, the area of the room depends on the amount of milk produced at the farm daily.

Fig. 4.13: Entry of an implements and workshop shed

Fodder production section

The cost of maintaining unhealthy animals is significantly high, due to their low production levels and the increased risk of spreading infections to healthy animals. Therefore, it is important to provide adequate nutrition to the cattle. The structural requirements for the fodder production section are discussed below.

Implements and workshop shed

The shed is meant for storing farm implements and carrying out mechanical repair work. It is constructed in a way to

accommodate tractors and other farm implements used for various farm activities. The width of the shed is usually at least 8 metres.

Practical Exercise

Activity

Draw the layout of a housing for dairy animals.

Material required: Writing material

Procedure

- Visit a nearby dairy farm. Go to its different sections.
- Take note of how different types of cattle are housed there.
- Draw the layout of the farm, indicating its different sections.
- Also, prepare a note based on your observations and give a presentation before the class.

Check Your Progress

A. Fill in the Blanks

1. The floor space requirement per cow in a milking parlour is _____.
2. The number of calving pens is generally _____ per cent of the breeding females.
3. For calves aged below 3 months, an area of _____ square feet is required in a calf shed.
4. A bull shed must have a minimum _____ feet high strong fence or boundary wall.
5. A casting pit should contain a minimum of _____ sand or sawdust as bedding material.

B. Mark 'True' or 'False'

1. The isolation yard is meant for housing young calves.
2. Heifers may be housed with young male calves.
3. Milking parlour is the place where milch animals are brought for milking.
4. A calving pen and a calf shed are same.
5. Buffaloes like to wallow in a pond or mud.

Unit 5

Transportation of Dairy Animals

17909CH05

Transportation of dairy animals is a routine farm practice. It includes movement of cattle by road, rail, ship or air. Livestock, including dairy animals, are transported for a number of reasons, such as auction, breeding, livestock shows and fairs, grazing, etc. However, the method of transportation depends on the size and age of the animals, and also the distance to be covered.

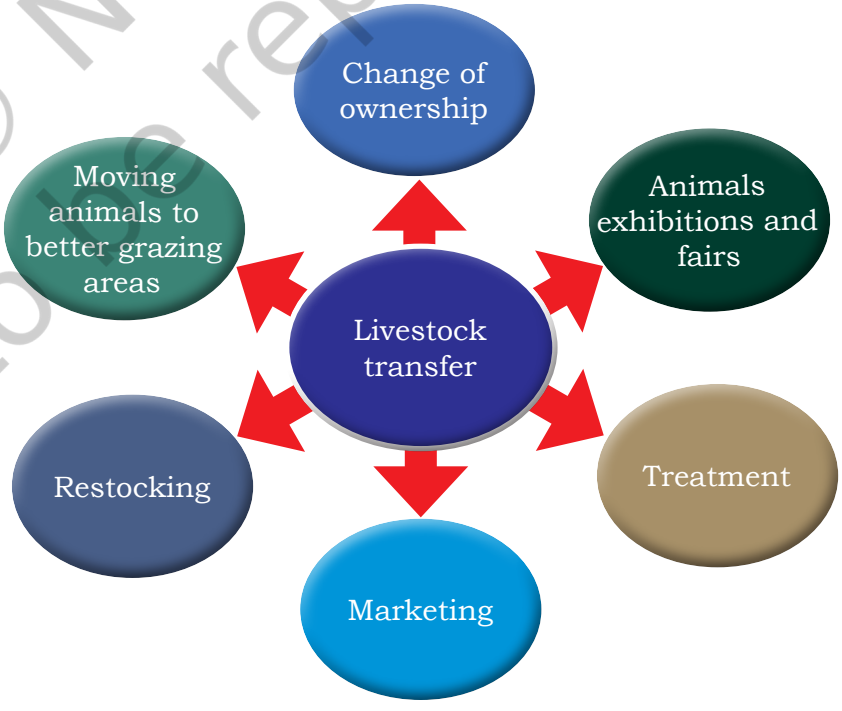


Fig. 5.1: Reasons for animal transportation

Purposes of Animal Transfer

Animals tend to stand during transportation. Therefore, the most important point that needs to be taken care of during transportation is ensuring the comfort, safety and security of the animals. Livestock transfer involves a number of activities, including animal handling, i.e., loading and unloading them. The difficulties faced by animals during transfer are illustrated in Fig. 5.2.

Therefore, transportation may cause significant stress to the animals. Such stress may be categorised into three types—physical (changes in temperature, humidity or noise), physiological (limited access to food and water) and psychological (exposure to new individuals or environment).

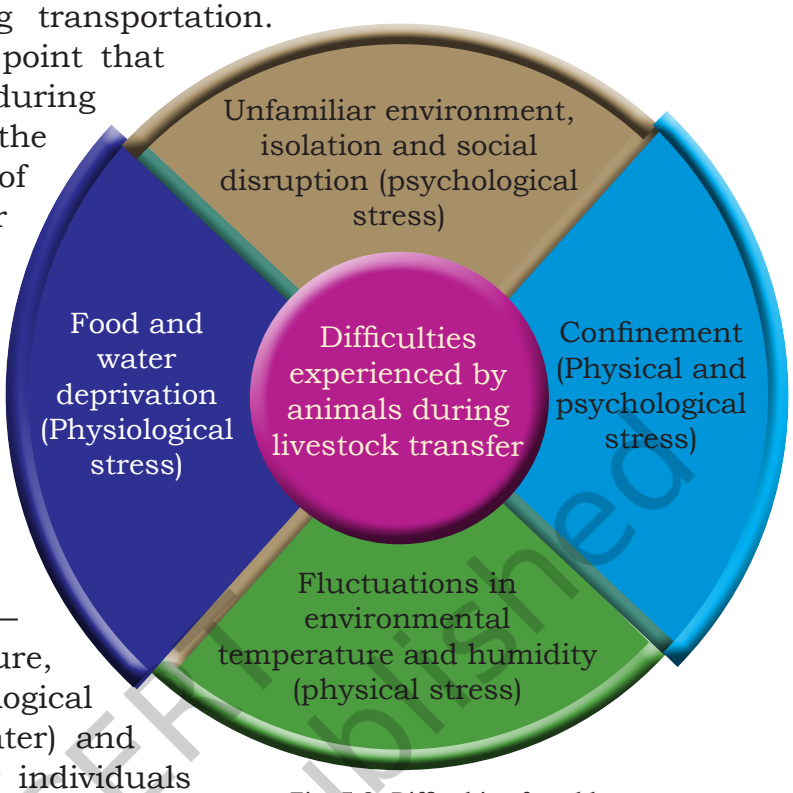


Fig. 5.2: Difficulties faced by animals during transfer

Points to note

Some of the points that need to be taken care of during animal transportation are as follows:

- Animal comfort and safety must always be kept in mind while planning transportation.
- The size, type and age of animals to be transported must always be taken into account.
- One needs to carefully decide and analyse the type of vehicle that would be appropriate for transporting the animals.
- One must also ensure that the vehicle used is fit and meets the safety standards.
- One must always check the animals to be transported for injuries, ailments and pregnancy, and consult a veterinarian, if needed.

MODES OF ANIMAL TRANSPORTATION

Dairy animals may be transported by various modes like road, rail, ship or air. Some such modes of animal transportation are depicted in Fig. 5.3.

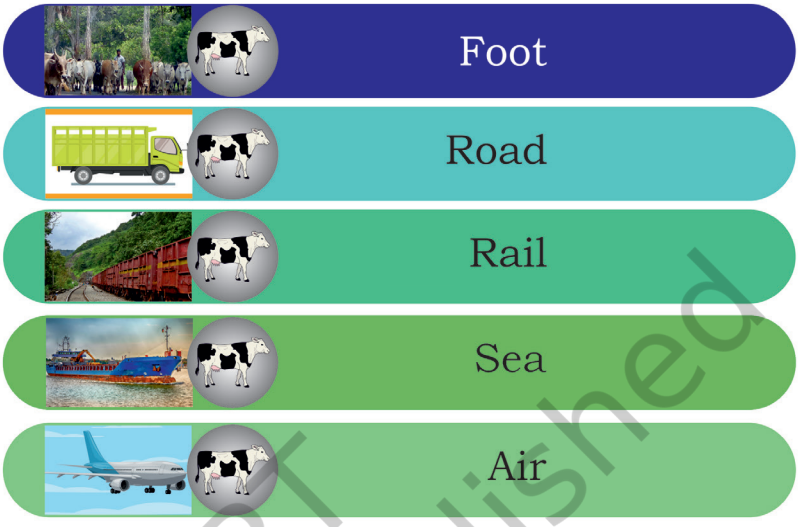


Fig. 5.3: Common modes of animal transportation

Transportation by foot

It is the most economical and easiest way of animal transportation, especially in case of short distances. Dairy farmers plan such a mode of transfer well in advance. They take into account the distance to be covered by the animals on foot and ensure arrangements for grazing, water and overnight rest during the journey. The animals are generally made to walk during the cooler hours of the day. The maximum distance they may cover on foot depends on various factors, such as weather conditions, age and body condition of the animals.

Table 5.1: Recommended Distance for Transportation by Foot

Animals	One day journey	More than one day	
		First day	Subsequent days
Cows and buffaloes	30 km	24 km	22 km
Sheep and goats	24 km	24 km	16 km

Precautions

Some of the precautions that need to be observed during cattle transfer by foot are as follows:

- The animals must not be made to walk in case of heavy rains, thunderstorm, or extremely dry or sunny weather conditions.
- They must not be made to walk a considerable distance before sunrise or after sunset.
- Since animal transfer by foot is a time-consuming affair, it may expose the animals to extreme environmental conditions, which may lead to fatigue, reduced body weight and other health problems.

Table 5.2: Specifications for Transportation of Dairy Animals by Foot

Animals	Maximum distance to be travelled (km/day)	Speed (km/ hour)	Maximum hours travel per day	Period of rest, drinking and feeding	Temperature (°C)	
					Max.	Min.
Cows	30	4	8	Give water to the animals every two hours. They must be fed at an interval of every four hours.	12	30
Buffaloes	25	3	8	Give water to the animals every two hours. They must be fed every four hours.	12	30
Calves	16	2.5	6	Give water to the animals every one-and-a-half hours. They must be made to eat every three hours.	15	25

Transportation by road

Dairy animals are usually loaded in trucks in case of road transportation. Before the animals are loaded, the truck is dusted and cleaned with a broom, and cattle bedding material like sand (10–12 cm deep) or straw bedding (15 cm) is laid on the surface.

The truck is connected to a ramp. After opening the rear door on the loading ramp, the gap between the door and the truck is covered with a plank. The animals are pushed from behind and loaded gently into the truck. Partitions, using bamboos or other suitable material, are often made inside the truck for each animal.

Ramp

A 'ramp' is a sloping surface that allows easy access to animals from lower to higher level and vice versa. It is used for loading and unloading the animals in a vehicle. Ramps must have a non-slippery surface to prevent the animals from slips and falls. The recommended angle of the loading ramp is 20° or less.

The truck is not loaded with any other merchandise during animal transportation. The animals should preferably be made to face towards the engine so that they do not get injured or scared during the journey. The animals may be placed in the truck in either head to head or tail to tail system. Feed and water must be provided to the animals at an interval of 8 to 10 hours. An attendant must always accompany the animals throughout the journey.

On reaching the destination, the animals are unloaded gently from the truck and made to exercise for sometime, and then allowed to rest. The number of dairy cattle to be loaded in a truck is given in the Table 5.3.

Table 5.3: Number of Cattle Permitted for Truck Transportation

Size of the truck	Average live weight (kg)				
	300	350	400	450	500
4 metre	11	10	9	8	7
5 metre	14	13	12	11	10
6 metre	18	16	15	13	12
7 metre	22	20	18	16	15

Advantages

Road transportation is suitable for long distances. Therefore, the animals reach the destination in lesser time compared with foot travel.

Disadvantages

The animals are exposed to extreme stress conditions, which may cause fatigue and increased chances of injury.

Transportation by train

Rail transport is preferred for animals tranfer in case of very long distances (more then 50 km). Cattle should preferably be transported by trains at night. The animals must be brought to a railhead or railway terminal. It must be ensured that they have received adequate rest. Besides, they must be provided water and feed at least an hour before the journey begins.

Specially-designed wagons are used for transporting cattle. To ensure animal comfort during transportation, the wagon must be loaded as per specifications. One must see to it that the animals stand close to each other. However, overcrowding must be checked in all circumstances. As per the specifications, an ordinary goods wagon must not carry more than 10 adult cattle or 15 animals.

Points to note

The following points need to be taken care of while transporting cattle by train:

- The wagon must be spacious enough to accommodate the animals.
- It must be ventilated.
- Adequate feed and water arrangements must be made for the animals in the wagon.
- The average space provided per animal must not be less than two square metres in the wagon.
- Every wagon carrying cattle must have at least one attendant.
- Cattle wagons must be attached to the middle of the train.
- Two breast bars are provided on each side of the wagon, one at a height of 60 to 80 cm and the other at 100 to 110 cm.
- The animals must be loaded parallel to the rails, facing each other.
- Rations for padding such as straw (not less than 6 cm thick) must be placed on the floor to avoid injury.
- Two breast bars must be provided on each side of the wagon, one at a height of 60 to 80 cm and the other at 100 to 110 cm.
- It must be ensured that the animals are unloaded, fed, given water and allowed to rest during the day.
- Milch animals must be unloaded during the day and milked.

Advantages

- Train travel causes less stress to the animals than road transportation.
- It is suitable for long distances as the journey takes lesser time than road transportation.
- Also, there are lesser chances of animal injuries compared with road transportation.
- It is a suitable and an economical mode for transporting a large number of animals.

Disadvantages

- The timing of journey needs to be in accordance with the railway schedule.
- It is not an appropriate mode for transporting a small number of animals and may prove to be a costly affair.

Transportation by sea

Animals are being transported via the sea for centuries. Usually, animals of high value and those to be used for breeding purposes are transported by the sea route. Transportation via this route is time-consuming. Each animal requires about 40 square feet space in a ship. There must be an attendant to take care of animals needs throughout the journey. The person must examine the animals (for health conditions, feed and water requirements) at an interval of every 2 to 3 hours.

Transportation by air

Animals of high value like racehorses, parent stock poultry, etc., are transported by air. But other livestock like cows, buffaloes, etc., may also transported by air under certain conditions.

ANIMALS NOT SUITABLE FOR TRANSPORTATION

- Weak, newborn and emaciated animals
- Aged animals
- Animals with severe injuries
- Those having difficulty in walking

- Animals nearing parturition
- Animals in advanced stage of pregnancy (cows and buffaloes are not transported for 250 and 280 days, respectively, after conception)
- Animals who have given birth in the past 48 hours
- During heavy rains, thunderstorm and very hot or cold weather conditions

Practical Exercise

Activity

Visit an animal fair in your area, and discuss the mode of dairy cattle transportation with farmers, who have come to showcase their livestock.

Material required: Writing material, mask and sanitiser

Procedure

- Visit an animal fair in your area.
- Discuss the mode of dairy cattle transportation with farmers. Note the different types of transportation they prefer.
- Ask the farmers about the precautions they need to take during cattle transportation.
- Examine the cattle for any injury.
- Prepare a write-up based on your observations and present it before the class.

Check your Progress

A. Multiple Choice Questions

1. The maximum distance that a cow may cover by foot during transportation is _____ km.
   (a) 10
   (b) 20
   (c) 30
   (d) None of the above
2. When animals are transported by a truck, they are provided feed and water at an interval of every _____ hours.
   (a) 24–26
   (b) 30–32
   (c) 8–10
   (d) None of the above
3. In case of _____ transportation, cattle should preferably be moved at night.
   (a) rail (b) road
   (c) air (d) sea

4. _____ animals are suitable for transportation.
   (a) Newborn
   (b) Healthy
   (c) Pregnant
   (d) Aged

B. Fill in the Blanks

1. A _____ is a sloping surface that allows access to animals from a lower to a higher level.
2. Transporting animals by _____ is the easiest and most economical.
3. High value animals like racehorses are transported by _____.
4. Each animal requires a space of about _____ square feet on a ship.

C. Mark 'True' or 'False'

1. Transportation of aged animals should be avoided.
2. In case of transportation by rail, the cattle wagon needs to be attached to the end of the train.
3. Animals nearing the time of parturition must not be transported.
4. Rail is the easiest and most economical mode of transportation for short distances.

Unit 6

Making Feed and Water Arrangements

Feed cost constitute nearly 70 per cent of the total cost incurred on a dairy animal. Animals must be provided with a balanced diet or ration, i.e., the feed must contain protein, carbohydrates, fat, minerals and vitamins in appropriate proportions. It must be palatable, moderately bulky, laxative, free of toxins and economical (Fig. 6.1). A balanced diet provides the animals with the required nutrients, energy and vitality, adding to their health and also increasing the milk yield.

17909CH06

This unit gives insight into the characteristics, composition, quality and types of animal feed.

Session 1: Characteristics, Composition and Quality of Animal Feed

Dairy animals are commonly fed with concentrates and fodder. Fodder is of two types—green and dry. The animals must be provided with both green fodder and concentrate mixture. However, concentrate mixture may be replaced by quality green fodder.

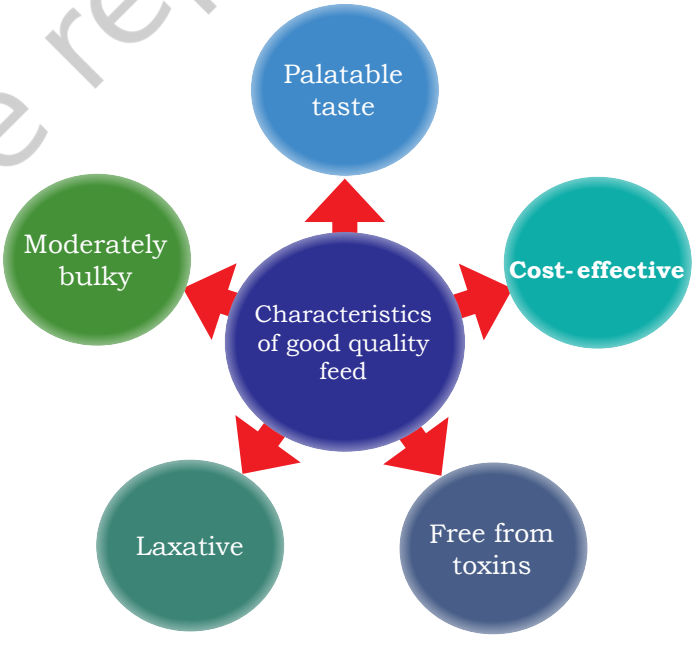


Fig. 6.1: Characteristics of animal feed

Types of animal feed

Animal feed may broadly be classified into three categories, depending on the percentage of Crude Fibre (CF), Total Digestible Nutrients (TDN) and additives (Fig. 6.2). After consuming the feed, the animal digests and metabolises the nutrients present in it.

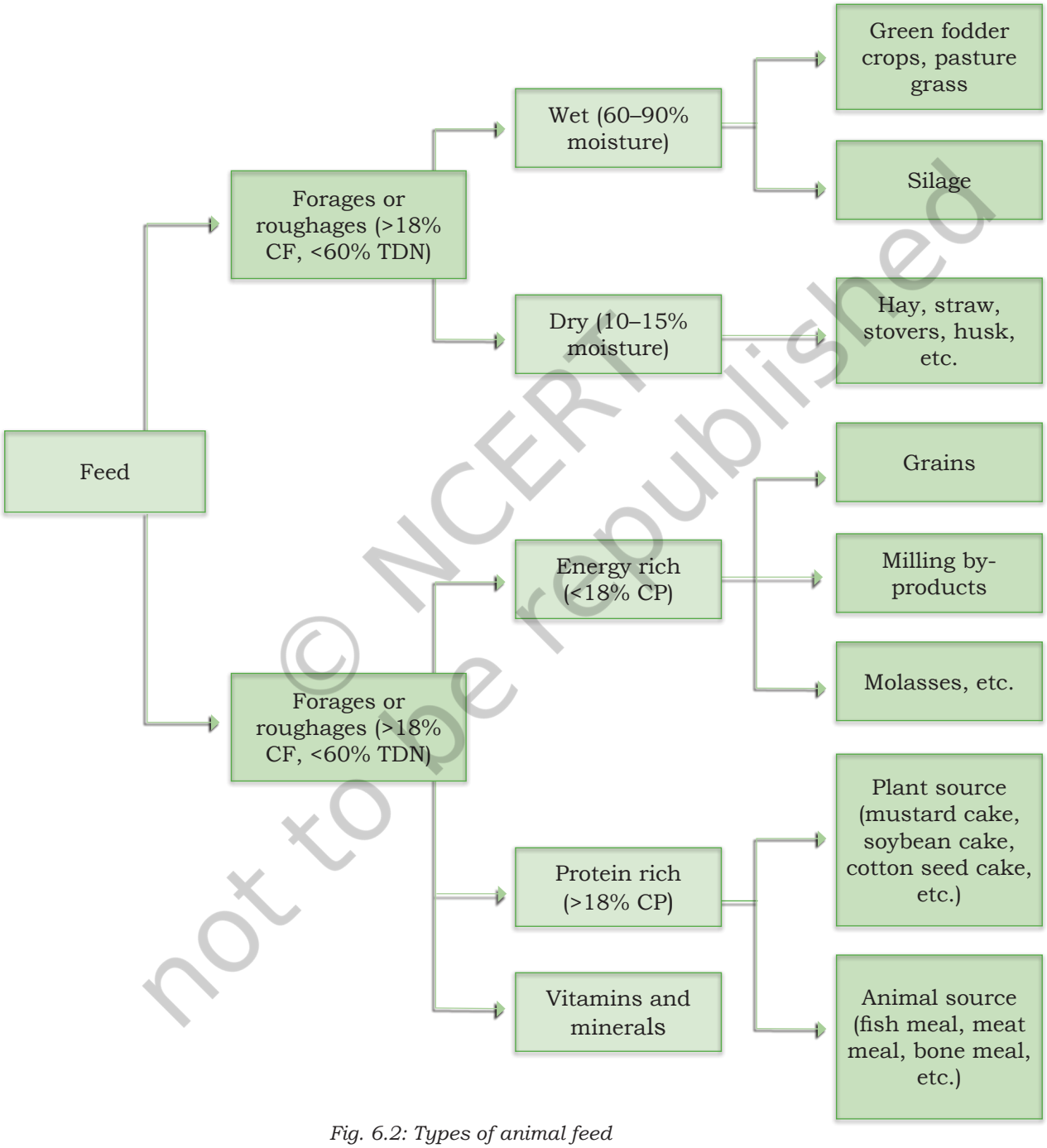


Fig. 6.2: Types of animal feed

Feed composition and quality

An ideal feed must meet an animal's requirements for nutrients (especially, protein and energy). The animal draws energy from Ether Extract (EE), Crude Fibre (CF), Nitrogen Free Extract (NFE) and Crude Protein (CP) components present in the feed. However, the CP component is the only source of protein for the animal. Hence, it is important to measure the exact proportions in which these components are present in the feed so as to ascertain its overall nutritive value.

The animal's health does not depend on the total amount of food consumed, but on its digestibility. After consuming the feed, the animal, just like humans, digests and metabolises the nutrients present in it. The digestible part present in the feed is metabolised and utilised by the animal, and not excreted in the faeces. Thus, it is the digestible part that determines the quantity and quality of the nutrients that the animal derives from the feed to carry out various functions like maintenance, growth, reproduction, production and draft.

Table 6.1: Constituents of Animal Feed and Their Components

Animal feed constituents			Components
Moisture			Water and volatile substances
Dry matter	Organic matter	Crude protein	Pure protein, amino acids, non-protein nitrogen compounds
		Ether extract (crude fat)	Fat, complex lipid, sterols, fatty acids and fat soluble dyes
		Crude fibre	Cellulose, hemicelluloses, and lignin
		Nitrogen-free extract	Soluble carbohydrate, hemicelluloses, lignin, pectin, organic acids, tannin and water soluble dyes
	Inorganic matter	Crude ash	Pure ash and organic residue

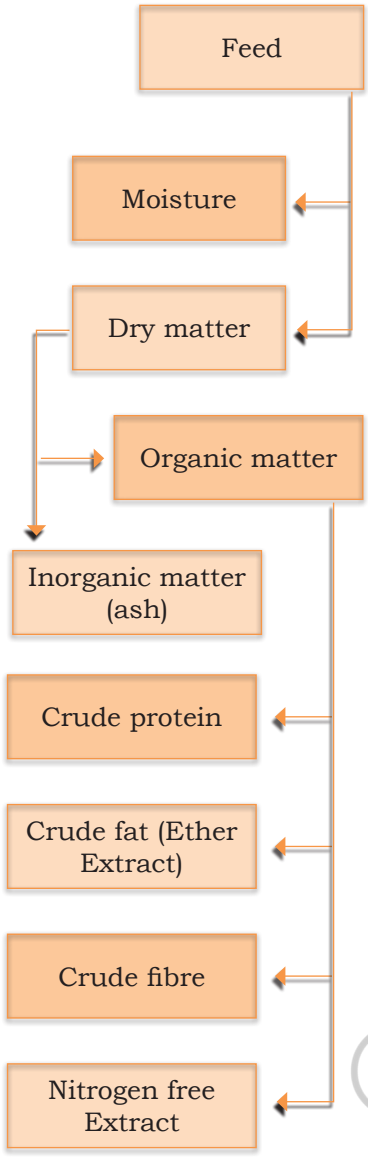


Fig. 6.3: Feed composition

Crude protein present in animal feeds

Ruminants like cattle, buffalo, goat, sheep, etc., can convert and utilise almost all plant nitrogen into animal protein that helps them to perform various activities and functions. In animal feed, CP is calculated on the assumption that the proteins present in it contain an average of 16 per cent nitrogen.

Table 6.2: Average Nutritive Value of Common Feed and Fodder on Fresh Weight Basis

Type of feed	Name	Moisture (%)	CP (%)	TDN (%)
Concentrate feed items				
Grains	Barley	10	9.5	75
	Jowar	10	7.2	70
	Bajra	10	6.6	65
	Gram	10	14.4	80
	Wheat	10	12.8	80
	Oats	10	10.4	75
Oilseed cakes	Groundnut cake	10	45	75
	Mustard cake	10	36	74
	Cotton seed cake	10	21.6	70
	Sesame (*til*) cake	10	45.6	78
Agro industry by-products	Wheat bran	10	15	60
	Rice bran	10	9.6	65
	Rice polish	10	12	67
	Arhar chuni	10	17	68
Animal by-products	Fish meal	7	55	65
	Meat and bone meal	5	40	69
Roughage				

Green fodder	Berseem	85	2.4	13
	Jowar	75	0.7	16
	Maize	75	1.6	17
	Oats	75	1.8	17
	Bajra	75	1.2	15
	Hybrid Napier	75	1.5	15
Straws and crop residues	Wheat straw	10	3	40
	Paddy straw	10	2	40
	Oat straw	10	7.2	55
	Maize kadbi	10	1.8	40
	Jowar kadbi	10	1.2	40
	Bajra kadbi	10	1.2	40
	Sugarcane tops	30	1.2	42
Hay	Dub hay	15	4.5	45
	Berseem hay	10	15	60
Silage	Maize silage	70	1.2	18
	Oat silage	70	1.4	18

Practical Exercise

Activity

Visit a nearby dairy farm and observe five feed items being offered to the animals living there. List the names of the feed items in a notepad, and write the moisture and CP content that each of these contain.

Material required: Writing material

Procedure

- Visit a nearby dairy farm.
- Observe the feed items that the cattle housed there are fed with.
- Write the names of these items in a notepad.
- Write the moisture and CP content present in each of these against their names.
- Prepare a write-up based on your observations and present it before the class.

Check Your Progress

A. Multiple Choice Questions

1. Feed fulfils which of the following requirements of animals?
   (a) Maintenance
   (b) Growth
   (c) Nutritional
   (d) All of the above
2. A good animal feed contains _____ in appropriate proportions.
   (a) protein
   (b) carbohydrates and fats
   (c) mineral and vitamins
   (d) All of the above
3. The digestible part of the feed is utilised by the animals for _____.
   (a) maintenance
   (b) growth and reproduction
   (c) draft activities
   (d) All of the above
4. Which of the following is not a characteristic of a good feed?
   (a) Bulky
   (b) Full of toxins
   (c) Clean and fresh
   (d) Rich in protein

B. Fill in the Blanks

1. Feed cost constitutes _____ per cent of the total cost of animal production.
2. TDN stands for _____.
3. Crude protein content present in feed is determined on the assumption that protein contains approximately _____ per cent of nitrogen.
4. Maize silage contains _____ per cent moisture content.

C. Mark 'True' or 'False'

1. An animal's TDN requirement changes according to its stage in life.
2. Silage is considered as concentrate feed.
3. A good animal feed must have sufficient protein content.
4. Moisture contains water and volatile substances.

Session 2: Feeding Dairy Animals

As already mentioned in the previous session, animals derive nutrients from the feed (i.e., concentrates and fodder) they consume. These nutrients provide them with the energy to carry out various functions like

maintenance, growth, reproduction, production and draft. Therefore, it is important to meet an animal's requirements for nutrients.

Animal feed requirements based on thumb rule methods

The following thumb rules are followed to calculate the feed requirement of cattle.

Feed requirements on the basis of dry matter content

All animal feed items contain some amount of moisture in the form of water. If all water is extracted from a feed, the remaining content is called 'dry matter'. Animals need to consume a certain amount of dry matter daily to maintain health and production. Most farmers feed concentrates, roughages and forages to the animals in order to meet their dry matter dietary requirement.

The daily dry matter requirement of indigenous cattle breeds is about 2–2.5 per cent of their body weight. Crossbred cows and buffaloes consume more dry matter, i.e., 2.5–3 per cent of their body weight daily.

Feed requirements on the basis of stage of production

Considering the animal's, different stages of production and to meet their nutritional needs optimally, a more refined thumb rule method is followed. Table 6.3 depicts an animal's requirement for dry fodder and concentrates at various stages of production.

Table 6.3: Animals' Requirement for Dry Fodder and Concentrates at Various Stages of Production

Type of animals	Stages of production				
	Maintenance		Milk production	Pregnancy (extra feed for animal pregnant for over five months)	Growth (extra feed for growth)
	Dry fodder (kg)	Concentrate (kg)	Concentrate	Concentrate (kg)	Concentrate (kg)
Indigenous cow	4–5	1.25	0.4 kg/litre milk yield	1.25	1

Crossbred cow	4–6	2	0.4 kg/litre milk yield	1.75	1
Buffalo	4–6	2	0.5 kg/litre milk yield	1.75	1
Breeding bull	As per choice of the animal	2.5	—	—	—
Bullock (working over four hours daily)	As per choice of the animal	—	—	—	—

Besides the quantity of dry fodder and concentrates as depicted in Table 6.3, an animal needs about 15–20 kg green fodder to meet its total nutritional requirement.

Major ingredients for feed preparation

Just like humans, animals too need a balanced diet for the maintenance of body and production of milk. A single feed ingredient cannot meet the total nutrient requirement of animals, thus various ingredients are mixed together so as to ensure that the animals get a balanced ration or diet. The major categories of feed ingredients used for preparing ration for dairy animals are given in Table 6.4.

Table 6.4: Major Feed Ingredients Used for Preparing Ration

Categories	Common ingredients
Cereals	Maize, wheat, barley, sorghum, millet, etc.
Oil cakes	Soybean, groundnut, rapeseed, cotton seed, sesame, mustard, etc.
Agricultural by-products	Wheat bran, rice bran, rice polish, broken rice, *dal chunnies*, etc.
Animal proteins	Fish meal, meat and bone meal, blood meal, etc.
Mineral sources	Di-calcium phosphate, limestone, oyster shells, dolomite stone, etc.
Other items	Molasses, vegetable oils, jaggery, etc.

(a) Maize

(b) Cotton seed cake

(c) Limestone powder

(d) Canola Meal

(e) Rice bran

(f) Oyster shell

(g) Wheat bran

(h) Di-calcium phosphate

(i) Molasses

Fig. 6.4 (a–i): Various feed ingredients used for preparing concentrate feed mixture for animals

Check your progress

A. Multiple Choice Questions

1. Which of the following is not a cereal?
   (a) Maize
   (b) Wheat
   (c) Barley
   (d) Mustard cake
2. Which of the following is not an agricultural by-product?
   (a) Rice polish
   (b) Soybean cake
   (c) Groundnut cake
   (d) Limestone
3. Which ingredient is not used for preparing a concentrate mixture for animals?
   (a) Wheat bran
   (b) Rice bran
   (c) Sugarcane
   (d) Maize

4. Di-calcium phosphate, limestone, oyster shells and dolomite stone are examples of _____.
   (a) mineral sources
   (b) animal proteins
   (c) agriculture by-products
   (d) None of the Above

B. Fill in the Blanks

1. Dairy animals consume two types of feed. They are _____ and _____.
2. When water is taken out from a feed, the remaining part is called _____.
3. An indigenous cow needs _____ kg concentrate per litre of milk yield.
4. Fish and bone meal are sources of _____.

C. Mark 'True' or 'False'

1. Fodder is always available in green form.
2. Maize, wheat, barley and sorghum are examples of cereals.
3. It is not necessary that all feed items contain some amount of water.
4. The daily dry matter requirement of indigenous cattle breeds is about 2–2.5 per cent of their body weight.

Session 3: Preparation of Animal Feed

It is important to feed dairy animals with a balanced ration, containing necessary nutrients in required proportions, as it affects their health, vitality, growth and production abilities. A balanced diet also helps an animal attain the desired body weight. Therefore, a dairy worker must be aware of the different type of feed items that must be fed to dairy animals and their preparation.

Fig. 6.5: Electronic chaff cutter

Green fodder

Dry fodder like wheat straw may be fed directly to the animals as they do not require any action. However, green fodder requires chaffing before being fed to the animals. A chaff cutter is used for cutting green fodder into small pieces so that they may be easily eaten by the animals. Chaffed fodder is more palatable and reduces wastage in the manger. There are two types of chaff cutter—manual and electronic (Fig. 6.5).

Concentrate

It is a mixture of various feed ingredients that is prepared in a farm itself. For preparing a concentrate, feed ingredients like grains, cake flakes, etc., are grounded in a feed grinder (Fig. 6.6). Then, all feed ingredients and supplements are mixed as required. Mixing may be done manually on the mixing floor or with the help of an electrical mixer (Fig. 6.7).

Fig. 6.6: Feed grinder

Fig. 6.7: Feed mixer

Composition of a concentrate mixture

Different feed ingredients are mixed in appropriate proportions to prepare a balanced diet or ration for animals. A mixture prepared in such a manner is called 'concentrate mixture' or 'compound cattle feed'. Concentrate mixture is fed to the animals in the form of mash, pellets, crumbles or cubes. The composition of concentrate mixture depends on the type of the animal, its milk production capacity, season of the year, etc. The concentrate mixture thus prepared is fed to the animal along with roughages (green and dry). The various feed items used for preparing concentrate mixture are depicted in Table 6.5.

Table 6.5: General Composition of a Concentrate Mixture

Ingredients	Proportion (%)
Grains (maize, sorghum, wheat, oat, barley, millets, etc.)	35–40
Oil cakes (cakes of mustard, cotton seed, groundnut, soybean, rapeseed, sunflower and linseed)	32–35
Agricultural by-products (molasses, tamarind seed powder, tapioca waste, rice and wheat bran, de-oiled rice bran, rice polish, etc.)	25–28
Mineral mixture and vitamins (di-calcium phosphate, common salt, and Vitamin A, D3 and E)	2
Salt	1
Total	100

Fig. 6.8: Various steps to prepare a concentrate mixture

Preparing concentrate mixture

A dairy worker is required to take care of the animals housed in a farm. Therefore, the person must be acquainted with the various steps required for preparing a concentrate mixture (Fig. 6.8).

Precautions to be taken

The following precautions must be taken while preparing a concentrate mixture:

- Grind maize and other grains for an hour or two prior to use.
- Separate storage areas for raw material; finished products must be provided to prevent cross-contamination.
- The feed must be kept dry (less than 12 per cent) to prevent fungal or bacterial growth.
- The feed must be stored in closed bags at a cool and dry place.
- Efforts must be made to prevent infestation (rodents and insects) of the feed.
- The stock inventory must be managed appropriately so as to ensure that the feed supplies do not deteriorate prior to use or during storage.

Storage of animal feed

The factors discussed in the sections below must be taken into account to ensure safe and scientific storage of animal feed.

Site selection

The structure for storing animal feed items must be located at a raised and well-drained site, which is free from dampness, excessive heat, insects, rodents, termites, etc.

Storage structure

The storage structure is selected on the basis of the quantity of feed to be stored, period for which it is to be stored and the available structural material at the

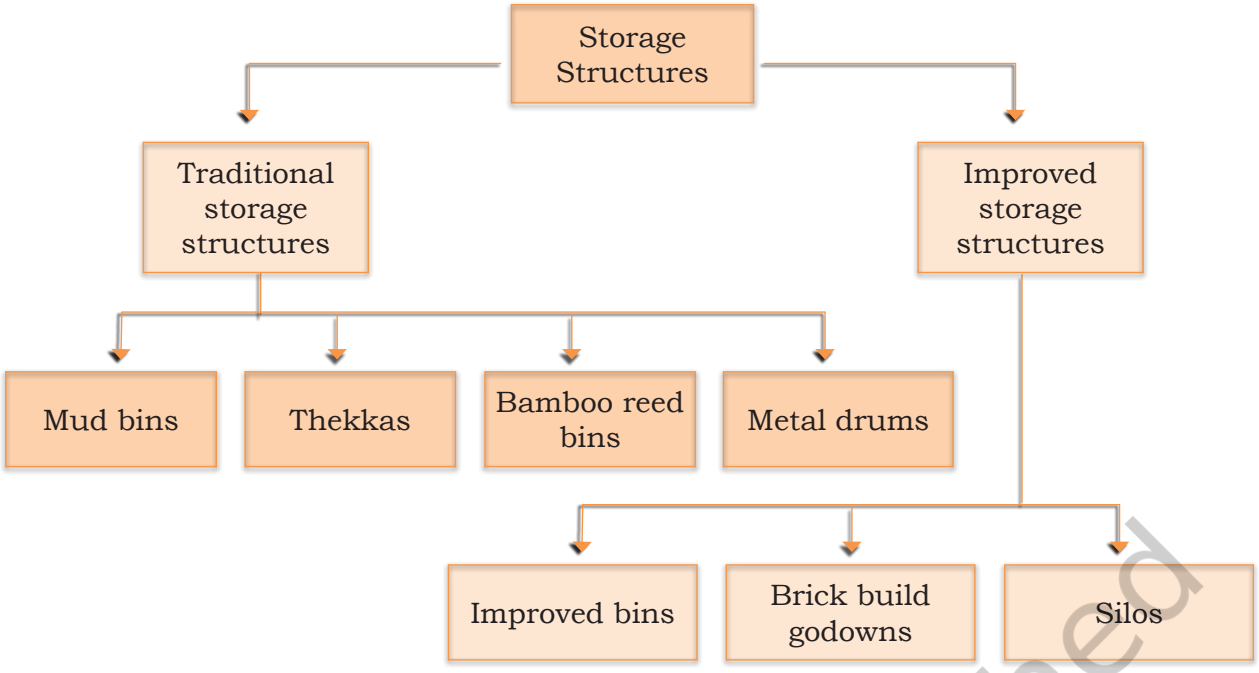


Fig. 6.9: Structures for the storage of animal feed items

farm. Sufficient space must be provided between two stacks of feed bags, and stacks and walls to ensure adequate aeration. Traditionally, feed ingredients are stored in countrymade storage structures prepared with locally available material. However, improved storage structures are also available to store large quantities of feed ingredients (Fig. 6.9).

Regular cleaning and fumigation

It is important to clean and fumigate the feed storage structure before storing the feed in it. The storage structure must not have cracks, holes or crevices.

Gunny bags for storage

It is easy to spot gunny bags, containing animal feed, in feed storage structures at the farm. One must always store fresh feed in new gunny bags. If the feed is to be stored in an old bag, then it must be duly boiled in a disinfectant solution and dried. It is only after doing so that the bag may be used for storing the feed.

Drying the feed

The feed ingredients must be dried appropriately before being stored to check quality deterioration.

Fig. 6.10: A feed godown with a raised platform

Fig. 6.11: Feed material arranged in stacks

Height of the platform

The platform of the feed storage godown or structure must be sufficiently high (usually 2–3 feet), so that it is free from moisture and seepage (Fig. 6.10).

Adequate aeration

The feed storage area must be built ensuring adequate aeration during dry weather conditions. Care must be taken to check aeration during the monsoon in order to protect the stock from infestations due to excess moisture.

Height of the stored feed material

The feed material must be stored up to a height of 5 metres only on a concrete floor, as shown in Fig. 6.11.

Separate storage for new and old stock

New and old stock must be stored separately. This prevents contamination in the new stock from the old one.

Maintenance of equipment and machinery

The various machines used in feed and concentrate preparation must be cleaned appropriately and regularly. Besides, they need to be periodically checked for accuracy and damages to ensure that they are in a working condition, and meet the required safety standards. If any damage is detected in a machine, it must be immediately sent for repair and servicing. Records of all maintenance works must be kept for future reference.

Practical Exercise

Activity

Visit a nearby dairy farm and observe dairy workers preparing animal feed. List the type of ingredients they use to prepare a concentrate mixture. Prepare a write-up and present it before the class.

Material required: PPE kit and writing material

Procedure

- Visit a nearby dairy farm.
- Observe the dairy workers preparing animal feed.
- You may also interact with the workers and find out the quantity of feed prepared for each adult animal and calf.
- List the type of ingredients they use to prepare a concentrate mixture.
- Prepare a write-up based on your observations and interaction, and present it before the class.

CHECK YOUR PROGRESS

A. Multiple Choice Questions

1. A _____ is a traditional storage structure.
   (a) silo
   (b) mud bin
   (c) improved bins
   (d) brick built godowns
2. The common ingredients used for preparing a concentrate mixture include _____.
   (a) grains
   (b) oil cakes
   (c) mineral mixture and vitamins
   (d) All of the above
3. Concentrate mixture is offered to animals in _____ form.
   (a) mashed
   (b) pelleted
   (c) crumbled
   (d) All of the above

B. Fill in the Blanks

1. The feed must be stored in closed bags in a _____ and _____ place.
2. Wheat straw is an example of _____ fodder.
3. A _____ is used for cutting green fodder into small pieces. The two types of chaff cutter are _____ and _____.
4. Adequate _____ must be ensured in a feed storage room during dry weather conditions.

SESSION 4: MAKING WATER ARRANGEMENTS

Dairy animals must be provided with appropriate and adequate quantity of feed and water at regular intervals for their health, growth, production and vitality. Systematic planning is required to ensure uninterrupted feed and water supply to the animals. The three components involved in planning regular feed and water supply to the animals are as follows:

- Material (feed and water)
- Labour (workforce)
- Machinery (like water pump, feed grinder and mixer, etc.)

If any one of these components is disturbed, the supply of feed and water gets adversely affected. Table 6.6 shows a broad plan to ensure the availability of feed and fodder in a dairy farm.

Table 6.6: Plan for Ensuring Regular Supply of Feed and Fodder in a Dairy Farm

S. No.	Type of feed	Planning
1.	Concentrate mixture	Most ingredients used for preparing a concentrate mixture are available at reasonable prices during the harvest season. But long-term storage of these items may lead to infestation and damage (caused by insects and rodents), incurring heavy losses to a farmer. These factors must be looked into before storing the ingredients for a longer period.
2.	Feed supplements	These are regularly added to the ration of the animals. After price and quality evaluation, these supplements may be purchased and stocked, if necessary.
3.	Dry fodder (wheat straw, etc.)	Wheat straw is easily available at discounted rates during the harvest season. It serves as dry fodder to the animals and may be used as feed material for a longer duration. Therefore, the farmer, with the help of dairy workers, must draw an estimate of the quantity of wheat straw required for the entire year and take appropriate storage measures, so that it may be used till the next harvest season.
4.	Hay and silage	These are usually prepared on the farm. Hay and silage are fed to the animals, in case there is a scarcity of green fodder.
5.	Forage cultivation	Green fodder may be cultivated, harvested and supplied for the entire year.

Water requirements of dairy animals

Cattle must be provided with quality drinking water so as to prevent them from catching several infections and diseases. Water is a major constituent in an animal's body. An adult animal's body contains about 65 per cent water. Water is regularly discharged from the body through urine, faeces, exhaled air and skin. Besides, lactating cows lose water through milk, which contains about 87 per cent water. An animal's requirement for water increases with milk yield, high protein diet, non-availability of succulent green fodder and climatic conditions (hot summer months). Dairy animals are

made to drink water throughout the day and even in the night. Water is also required for washing the animals, and cleaning their sheds and other areas.

Generally, the water intake of an animal is about 8–10 per cent of its body weight during normal weather conditions. However, it may reach up to 13–14 per cent of its body weight, in case of hot weather conditions. Consider the following example:

- Assume a cow's weight to be 400 kg.
- So, it must be made to drink water that is 10 per cent of its total body weight. This is important to maintain its normal body condition and produce 10 litres of milk daily.
- Therefore, for every litre of milk produced the cow requires 1.5 times more water. Thus, for 10 litres of milk, it requires 10×1.5 litres = 15 litres of water.
- Thus, a 400 kg cow, producing 10 litres of milk must be provided with [(400×10%) + (10×1.5) litres = 40+15 litres = 55 litres] 55 litres of drinking water daily.

Some of the aspects that need to be taken into account while planning water requirements for dairy animals are discussed in the sections below.

Drinking

Watering points must be constructed in a farm in such a way that the animals are able to access water easily. The quality of the drinking water needs to be maintained at all times. The animals need more water during summer. Therefore, adequate water arrangements must be made during this season.

Washing

Milch animals must always be washed just before milking, so that no dirt or dung falls into the milking utensil and contaminates the milk. Other categories of animals may be washed once a day. During summer months, the animals must be washed at least twice a day. This helps in maintaining their normal body temperature.

Cleaning animal sheds and other areas

Appropriate hygiene standards must be maintained in the farm premises at all times. Animal sheds and other areas in the farm must be cleaned appropriately every day. This helps in checking infections and outbreak of diseases.

Factors affecting water need of dairy animals

Some of the factors affecting the water requirements of dairy animals are shown in Fig. 6.12.

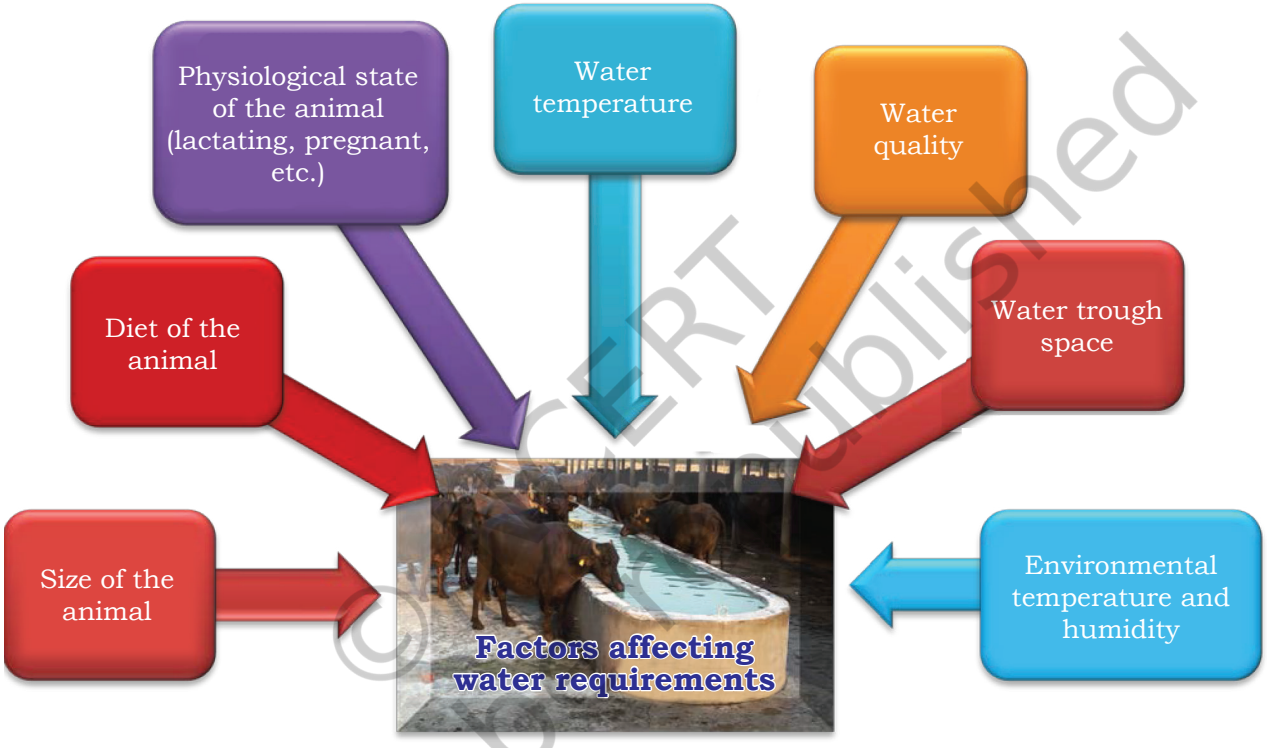


Fig. 6.12: Factors affecting water requirement of dairy animals

Points to note

- A dairy animal drinks water several times a day. The total water intake per day depends on the type of feed available to the animals and their milking status (milch or dry).
- Cattle, generally, consume 30 to 40 per cent of their daily water requirement within one hour of milking.
- The temperature of drinking water for cattle must be 17–27° C.

- The minimum depth of water in a trough should be 3 inches, so that the animals are able to submerge their muzzle and drink water easily.
- A paddock must have at least two watering points (water troughs) for each group of animals. Such an arrangement ensures adequate water intake by all animals as per the requirement without any interference from dominant animals in a group.

Practical Exercise

Activity

Visit a nearby dairy farm and find out the daily drinking water requirement of a lactating cow during summer months.

Material required: Writing material and PPE kit

Procedure

- Visit a nearby dairy farm and talk to the animal supervisor.
- Find out the body weight of a lactating cow.
- Also, note the average milk produced by the animal per day from the farm records.
- Calculate the cow's drinking water requirement, using the formula as given in the session, i.e., (animal's body weight × 10%) + 1.5 × quantity of milk produced).
- Prepare a write-up based on your observations, interaction and findings, and share it with the class.

Check Your Progress

A. Fill in the Blanks

1. An adult dairy animal requires about _____ per cent water of its body weight during normal weather conditions.
2. An adult dairy animal's body contains about _____ per cent water.
3. During harvest season, _____ is easily available at discounted rates.
4. In hot weather conditions, a dairy animal's water intake increases by up to _____ per cent of its body weight.

B. Mark 'True' or 'False'

1. Milch animals are washed just before milking.
2. A lactating cow's milk contains about 80 per cent water.
3. Hay and silage are fed to the animals, if there is a shortage of green fodder.
4. The temperature of drinking water for cattle must be 17–27° C.

Glossary

Concentrates: *Concentrates are feed for animals that are high in energy, low in fibre and digestible.*

Crossbred animals: *These are produced by crossing indigenous with exotic or foreign breeds.*

Dairy animal: *It is the one that is reared for milk production.*

Dairy farmer: *He/she manages various operations at a dairy farm, where cattle are kept and reared for milk production. The person's responsibilities vary according to the size of the farm and the animals housed there.*

Dairy farming: *It is a branch of agriculture that encompasses breeding, rearing and milking of dairy animals, especially cows and buffaloes.*

Exotic animals: *These are not native to the nation in which they are kept. They belong to foreign countries. The two important exotic cow breeds in India are Jersey and Hostein Friesian.*

Feed: *It is food for livestock.*

Fodder: *This includes plants or parts of a plant eaten by livestock, for example, hay, straw, etc.*

Fumigation: *It is the method of killing insects and pests in a godown, feed storage area, animal shelter and other areas of a farm by releasing gaseous pesticides or fumigants.*

Hay: *It is dried fodder used as animal feed.*

Heifer: *It is a female dairy animal that has never given birth.*

Indigenous animals: *These animals are found naturally in a place or are native to a place, for example, sahiwal, gir, etc., are indigenous to India.*

Livestock: *These are domestic animals raised in a farm for domestic use or for profits, like poultry, cows, buffaloes, goats, sheep, pigs, horses, camels, etc.*

Milking: *It is the act of drawing milk from female dairy animals for human consumption.*

Paddock: *It is a small enclosed field, where animals are left to graze. It is usually located near a shed in a farm.*

Ration: *It is the feed to be given to an animal during the day. The feed may be given at a time or in portions at specified intervals.*

Records: *These comprise information or data collected and preserved on a particular subject.*

Roughage: *These are feed items that are rich in fibre (cellulose), less digestible and lower in energy levels.*

Silage: *It is the fodder that is fermented and preserved in high moisture conditions. It is usually fed to cattle.*

Silo: *It is a container, in which the green fodder is fermented for silage-making.*

Answer Key

Unit 1: An Overview of Dairy Farming in India

A. Multiple Choice Questions

1. (a) 2. (b) 3. (b) 4. (c)

B. Fill in the Blanks

1. largest producer, 23
2. 3
3. National Programme for Bovine Breeding and Dairy Development, Rashtriya Gokul Mission and Foot and Mouth Disease–Control Programme (Students can write the name of any of these schemes)
4. crossbred and exotic cows

C. Mark 'True' or 'False'

1. False 2. False 3. False 4. True

Unit 2: Important Dairy Breeds in India

A. Multiple Choice Questions

1. (c) 2. (a) 3. (c) 4. (a)

B. Fill in the Blanks

1. Crossbred 2. Nili-Ravi
3. Holland 4. distinctly brown

C. Mark 'True' or 'False'

1. True 2. False 3. False 4. False
5. True

Unit 3: Livestock Housing System I

Session 1: Basics of Animal Housing

A. Multiple Choice Questions

1. (a) 2. (b) 3. (d) 4. (c)

B. Fill in the Blanks

1. open, resting 2. single, double
3. temperate 4. tail to tail

Session 2: Equipment and Machinery Required in a Dairy Farm

A. Multiple Choice Questions

1. (a) 2. (c) 3. (d) 4. (b)

B. Fill in the Blanks

1. 0.6 to 0.7
2. lesser
3. nose ring
4. more

C. Mark 'True' or 'False'

1. False
2. True
3. False
4. False

Session 3: Routine Activities in a Dairy Farm

A. Fill in the Blanks

1. daily
2. monthly
3. yearly or quarterly
4. daily

B. Mark 'True' or 'False'

1. False
2. True
3. True
4. False

Unit 4: Livestock Housing System II

A. Fill in the Blanks

1. 1.7× l.2 m
2. 5
3. 20–25
4. 4
5. 15 cm

B. Mark 'True' or 'False'

1. False
2. False
3. True
4. False
5. True

Unit 5: Transportation of Dairy Animals

A. Multiple Choice Questions

1. (c)
2. (c)
3. (a)
4. (b)

B. Fill in the Blanks

1. ramp
2. foot
3. air
4. 40

C. Mark 'True' or 'False'

1. True
2. False
3. True
4. False

Unit 6: Making Feed and Water Arrangements

Session 1: Characteristics, Composition and Quality of Animal Feed

A. Multiple Choice Questions

1. (d)
2. (d)
3. (d)
4. (b)

B. Fill in the Blanks

1. 70
2. Total Digestible Nutrients
3. 16
4. 70

C. Mark 'True' or 'False'

1. True 2. False 3. True 4. True

Session 2: Feeding Dairy Animals

A. Multiple Choice Questions

1. (d) 2. (d) 3. (c) 4. (a)

B. Fill in the Blanks

1. concentrates, fodder 2. dry matter
3. 1.25 4. animal protein

C. Mark 'True' or 'False'

1. False 2. True 3. False 4. True

Session 3: Preparation of Animal Feed

A. Multiple Choice Questions

1. (b) 2. (d) 3. (d)

B. Fill in the Blanks

1. cool, dry 2. dry
3. chaff cutter; manual, electronic. 4. aeration

Session 4: Making Water Arrangements

A. Fill in the Blanks

1. 8–10 2. 65
3. wheat straw 4. 13–14

B. Mark 'True' or 'False'

1. True 2. False 3. True 4. True

Suggested Readings

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