

Dairy Farmer–I

(Job Role)

Qualification Pack: Ref. Id. AGR/Q4101

Sector: Agriculture

Textbook for Class XI

विद्यया ऽ मृतमश्नुते



एन सी ई आर टी
NCERT

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

ISBN 978-93-5292-094-5

First Edition

September 2018 Bhadrapada 1940

PD 5T SU

**© National Council of Educational
Research and Training, 2018**

₹ 120.00

*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 Dee Kay
Printers, 5/16, Industrial Area, Kirti
Nagar, New Delhi 110 015

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FOREWORD

The National Curriculum Framework–2005 (NCF–2005) recommends bringing 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 setting will make one appreciate the worth of social life and what is valued and appreciated in 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 the workplace. The NCF–2005 also emphasises on 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, NCERT has attempted to infuse work across the subject areas and also contributed in 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 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 NCERT has developed learning outcomes based modular curricula for the 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 Human Resource Development.

This textbook has been developed as per the learning outcomes based curriculum, keeping in view the National Occupational Standards (NOS) 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 contribution of the development team, reviewers and all the institutions and organisations, which have supported in the development of this textbook.

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

HRUSHIKESH SENAPATY

Director

New Delhi
June 2018

National Council of Educational
Research and Training

ABOUT THE TEXTBOOK

A Dairy Farmer profitably manages various activities in a dairy farm, like production and marketing of milk, and maintaining health and productivity of cattle.

A dairy farmer is expected to demonstrate the ability to make various strategic and operational decisions in dairy production. This requires clarity of processes and a result-oriented approach. Dairy farmers are the primary producers in the milk supply chain. They add value to their product by adopting methods of production that satisfy the demands of customers and processors. The textbook gives future dairy farmers relevant guidance on how these objectives can be achieved on their farms.

The textbook has been written in a practical format for students desirous of engaging in the production of milk from dairy animals. The textbook focuses on the relationship between consumer safety and economic, social and environmental management at the farm level. The textbook contains many individual practices that contribute to good dairy farming practice, covering the key aspects of animal health, milk hygiene, nutrition, welfare, the environment and socio-economic management.

The practices recommended in the textbook have been drawn from practical experience at the Nanaji Deshmukh Veterinary Sciences University at Jabalpur, Madhya Pradesh. The students are encouraged to select and implement those guidelines that are of relevance to their situation. As such, the textbook aims to provide a framework for dairying schemes to be developed nationwide, providing individual entrepreneurs and dairy farmers the opportunity to develop dairy farming specific to their needs.

To achieve these objectives, the textbook has been developed with the contribution of many subject experts. It is hoped that the textbook will be useful for students aspiring a career in veterinary and dairying sector. Adequate care has been taken to align the contents of the textbook with the National Occupational Standards (NOS) for the job role of Dairy Farmer. This will enable the students to acquire necessary knowledge and skills as per the performance criteria mentioned in the Qualification Pack by Agriculture Skill Council of India. The textbook has been reviewed by experts so as to ensure the content is not only aligned with the National Occupational

Standards, but is also of high quality. The NOS for the job role of Dairy Farmer covered in the textbook are as follows.

1. AGR/N4101: Prepare and Maintain Livestock Accommodation
2. AGR/N4102: Establish Livestock within Accommodation
3. AGR/N4103: Provide Feed and Water for Livestock

The textbook has been divided into four units. Unit 1 gives an introduction to dairy farming, important cow and buffalo breeds and potential of dairy farming in generating employment. Unit 2 discusses preparations for livestock accommodation and how to maintain accommodation facilities at a dairy farm. Establishing livestock within accommodation and monitoring their accommodation are covered in Unit 3. Unit 4 covers provision for feed and water for livestock, receiving and storing the feed, and monitoring and maintaining the supply of feed and water to the livestock. It is hoped that this textbook will prove to be useful for students and teachers who opt for this job role. Further suggestions for improving the textbook are always welcome.

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ACKNOWLEDGEMENT

The National Council of Educational Research and Training expresses its gratitude to all members of the Project Approval Board (PAB) and officials of the Ministry of Human Resource Development (MHRD), Government of India, for their cooperation in the development of this textbook. The Council also extends gratitude to all the contributors for sharing expertise and valuable time by positively responding to the request for the development of this textbook.

The Council also acknowledges the contribution of Saroj Yadav, *Professor and Dean (A)*, NCERT, Ranjana Arora, *Professor and Head*, Department of Curriculum Studies (DCS), NCERT, Arum Khan, *Assistant Professor* (Contractual), Central Institute of Educational Technology, Pushplata Verma, *Assistant Professor*, Department of Education in Science and Mathematics and Anita Nuna, *Professor*, DCS, NCERT in carefully evaluating and giving suggestions for the improvement of this book.

The Council would also like to thank Rajesh Khambayat, *Joint Director*, Pandit Sunderlal Sharma Central Institute of Vocational Education (PSSCIVE), Bhopal for providing support and guidance in the development of this textbook. Special thanks are due to P.D. Juyal, *Vice Chancellor*, Nanaji Deshmukh Veterinary Science University (NDVSU), Jabalpur for constant encouragement and support during preparation of the textbook, and to Biswajit Roy, *Associate Professor*, Department of Livestock Production Management, NDVSU, Jabalpur for providing photographs of the animals and for preparing other visuals included in the textbook. The photographs have been selected with care and diligence for clearer understanding of learners. Care has been taken to not violate any copyright. The images are meant for educational purpose and are being provided for the personal use of students and teachers.

The meticulous copyediting and valuable inputs by Madhavi Ratnaparkhi, *Assistant Editor* (Contractual) and Garima Syal, *Proofreader* (Contractual) of the Publication Division are duly acknowledged. The efforts of Pawan Kumar Barriar, *DTP Operator*, Publication Division, NCERT and Nitin Kumar Gupta, *DTP Operator* (Contractual) of Publication Division for flawless layout design are also acknowledged.

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Do You Know

According to the 86th Constitutional Amendment Act, 2002, free and compulsory education for all children in 6-14 year age group is now a Fundamental Right under Article 21-A of the Constitution.

**EDUCATION IS NEITHER A
PRIVILEGE NOR FAVOUR BUT A
BASIC HUMAN RIGHT TO
WHICH ALL GIRLS AND WOMEN
ARE ENTITLED**

*Give Girls
Their Chance !*



Unit

1



Introduction to Dairy Farming

INTRODUCTION

Dairy farming has been an important part of the agricultural scenario for thousands of years. India being a predominantly agrarian economy has about 70 per cent of its population living in villages, where livestock play a crucial role in the socio-economic life. Livestock provide high-quality foods such as milk, cheese, butter, ghee, etc. India is not only one of the top producers of milk in the world, but also the largest consumer of milk and milk products in the world. Due to the shortfall in supply, we have to import significant amounts of milk products to meet internal demand.

Agriculture and animal husbandry have a symbiotic relationship, in which the agricultural sector provides feed and fodder for the livestock and animals provide milk, manure and draught power for various agricultural operations. Dairy sector is instrumental in bringing socio-economic transformation in India. It has created a lot of employment opportunities and also provides improved nutritional benefits.

Animal husbandry is a major sub-sector of agriculture sector and contributes about 28.6 per cent to the agricultural value output (*Annual Report 2017-18*, Department of Animal Husbandry, Dairying and Fisheries, Government of India). The growth rate of 6.27

per cent and 6.37 per cent during 2015–16 and 2016–17, respectively in the livestock sub-sector is much faster than the overall 0.7 per cent and 4.9 per cent growth rate of agriculture and allied sector during the same period (*Economic Survey*, 2016–17). The statistics indicate that there is a lot of employment potential for entrepreneurial activities in the dairy sector. This Unit discusses the scope of dairy sector in the Indian context.

SESSION 1: DAIRY FARMING IN INDIA

Importance of dairy farming

Milk is a wholesome food among all the animal products. It contains in proper proportions the various essential food ingredients required by human body in an easily digestible form. Inclusion of milk in the human diet increases the digestibility of other types of food as well.

The productivity of milk varies in different countries, as some countries are surplus in production, some are deficit in production, and in some of the countries, availability matches their requirement.

The annual milk production in India in 2015–16 was 155.5 million tonnes and the per capita availability of milk was 337 grams per day.

In India, milk is produced by a vast number of small, medium and large-sized farms. There is exponential growth in the number of the commercial dairy farms in the urban and semi-urban areas of the metros and big cities.

It is clear from Fig.1.1 that 49 per cent of milk production comes from 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 highest in Punjab, followed by Haryana (Basic Animal Husbandry Statistics, Government of India, 2017). It is interesting to note that in 2016–17, the per

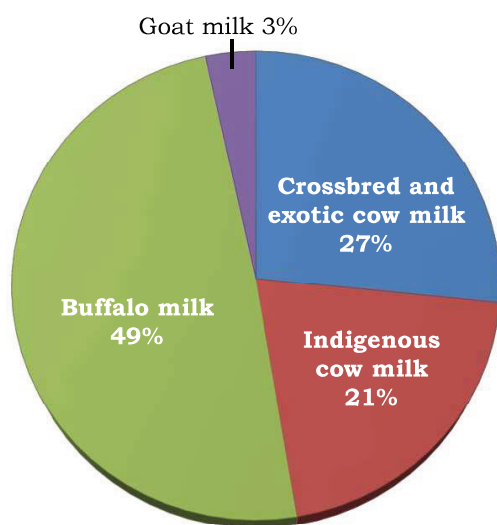


Fig.1.1: Milk production from dairy animals in India



capita availability of milk was highest in Punjab at 1075 grams, followed by Haryana at 930 grams, whereas Delhi recorded a dismal 35 grams.

The demand for milk is constantly increasing in cities as well as small towns and rural areas. The factors influencing this increased demand are — rapid increase in population, spread of education, growing nutritional awareness and improved purchasing power of consumers.

Dairy farming in India has evolved from just an agrarian way of life to a professionally managed industry. A large number of rural families in India are engaged in dairy production, for whom this is an important source of secondary income.

In India, raw milk is perceived to be fresh by most consumers and has a large market. Conventional dietary habits in India account for about 60 per cent of milk consumption in liquid form, and the remaining in the form of ghee, cheese, curd, paneer, ice cream, dairy whiteners and traditional sweets.

Dairying provides a source of daily income with a relatively low level of risk. Most of the dairy farmers in India raise animals at a small scale in traditional ways. The productivity of these farmers can be enhanced if they run their business in a scientific manner. Most of such farmers are not aware of the modern methods of dairy farming. As a result, some farmers lose their investment instead of making profit. To ensure maximum production and profits from dairy farming, it is essential that these farmers adopt proper business plans and good dairy management practices.

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 dairy sector provides basic sustenance for small farmers, landless people and agricultural labourers, especially for people in draught affected areas in Rajasthan and Gujarat.

Employment potential in dairying

India's share in the world milk trade is quite low, and compared to the total milk produced, only small quantity



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of it is processed. In the informal sector, milk vendors collect milk from local producers and sell it in urban and semi-urban areas. These milk vendors handle around 65–70 per cent of the total milk production.

The increase in human population has a direct effect on the demand for food. However, globally there is shrinkage of cultivable lands, which makes the role of livestock sector even more important, not only in terms of nutritional security but also employment generation.

The Agricultural and Processed Food Products Export Development Authority (APEDA) is the regulator for import and export of dairy products in India. Indian milk desserts are quite popular with many communities, including the Indians settled abroad. A good example of this is the *rasgulla*, which has earned a place of honour as a sweet meat worldwide. It is clear that the demand for such products is expected to increase in future, thereby boosting the potential for export. Considering the production economics of dairy products globally, countries which have low cost of milk production such as India are expected to derive maximum benefit from the booming dairy upsurge. Thus, from the emerging scenario in the dairy sector, nationally as well as internationally, it is evident that a lot of employment generation and potential for entrepreneurial activities exist in the dairy sector.

Practical Exercise

Activity 1: Evaluate the potential for employment in dairy farming in India.

Material required

Computer, Internet

Procedure

1. Collect data from the site of animal husbandry and labour ministry (<http://dahd.nic.in>; <http://labour.gov.in>).
2. Note down the number of people involved in dairy sector during the last 20 years.
3. Evaluate the data, and calculate the increase in the number of persons involved in the dairy sector.



Check Your Progress

NOTES

A. Multiple choice questions

1. APEDA regulates _____.
(a) import of milk products (b) export of milk products
(c) Both (a) and (b) (d) None of these
2. Majority of milk produced in India is handled by _____.
(a) cooperatives
(b) private milk vendors
(c) government agencies
(d) big milk processing companies
3. Which state produces maximum quantity of milk in India?
(a) Uttar Pradesh (b) Madhya Pradesh
(c) Punjab (d) Haryana
4. Which of the following states has the highest per capita milk availability?
(a) Uttar Pradesh (b) Madhya Pradesh
(c) Punjab (d) Haryana
5. The contribution of buffalo milk to the total milk production in India is about _____.
(a) 25 per cent (b) 49 per cent
(c) more than 60 per cent (d) None of these

B. Fill in the blanks

1. Per capita milk availability in India in the year 2015–16 was _____.
2. The share of goat milk in the total milk production in India is about _____ per cent.
3. The livestock sector contributes significantly in terms of nutritional security and _____.

C. Mark true or false

1. In India, the maximum quantity of milk is sold to the market in the form of milk products.
2. Per capita milk availability in India is 100 grams.
3. Dairy provides seasonal income to the farmers in India.
4. India is the biggest consumer of dairy products in the world.
5. A majority of dairy farmers in India raise animals on a small scale.



SESSION 2: IMPORTANT BREEDS OF CATTLE

A breed is a sufficiently large group of animals evolved by human efforts through the principles of breeding over the past several centuries. The controlled rearing of domestic animals to improve their desirable qualities is called animal breeding. Some of the major techniques of animal breeding are selective breeding and cross-breeding. The members of a breed have a common ancestry and possess similar physiological and economic characteristics that are inherited in that breed. In India, a number of indigenous (*desi*) cattle breeds as well as crossbred cattle are engaged in milk production (Table 1.1). Crossbred cattle are developed by crossing the indigenous (*Bos indicus*) and exotic cattle (*Bos taurus*) breeds. Exotic dairy cattle breeds originated in different climatic conditions and have higher milk production potential, but these breeds are not well adapted to the Indian climatic conditions.

In India, large percentage of cattle population is mainly reared for milk and draught/draft purposes. Only about 22–25 per cent of the cattle population is classified as breed and rest is considered as non-descript. One of the interesting characteristics of indigenous cattle is the presence of hump. Based on the utility, cattle breeds are classified as milch purpose breed, dual purpose breed and draft purpose breed. There are 41 well-known registered indigenous cattle breeds in India, some of which are of milch type, such as Gir, Hariana, Sahiwal, Red Sindhi and Tharparkar (Table 1.2).

Table 1.1: Indigenous cattle breeds of economic importance

Breed	Other names	Habitat	Colour	Distinguishing characteristics	Utility
Gir	Kathiawari, Surti, Desan	Kathiawar region of Gujarat	Red with black hue. A few white spots are also found in some cows.	The dewlap is big and thick. The hump is well developed. The limbs are widely placed but are not so muscular.	Cows are good milkers. Bullocks are heavy and powerful animals, but are medium paced in movement.



Haryana		Haryana, Western U.P. and Eastern Rajasthan	White or light grey	Pole on the top of forehead. Long narrow face and flat forehead. The short curved horns emerge from the outer angle of pole. Ears are sharp and small. Dewlap is small, and the udder is well formed.	Bullocks are good draught animals particularly for fast ploughing and road transport. Cows are good milkers.
Sahiwal	Montgomery, Multani, Lola	Montgomery district of Pakistan	Reddish or pale red and sometimes with white patches	The forehead is broad with bright eyes and blunt thick horns. The hind quarters are well developed.	Bullocks are used both for ploughing and for carting. Cows are good milkers.
Red Sindhi	Sindhi	Karachi and Hyderabad regions of Pakistan	Deep dark red	A white mark on the forehead is present. Well-proportioned head with moderate size. Thick horns emerging laterally. Rounded drooping quarters, well-developed hump, dewlap and milk veins.	Cows are very good milkers. Bullocks are used for heavy load on roads.
Tharparkar	Thari	Marwar region in Rajasthan and Gujarat	White or light grey	Animals have short straight and strong limbs. They have moderately long face with broad pole and slightly bulging forehead. Males give a general impression of virility. Horns are of medium size. In young animals, particularly, there is a white or light grey line along the spine.	Bullocks are used for ploughing and carting. Cows are very good milkers.

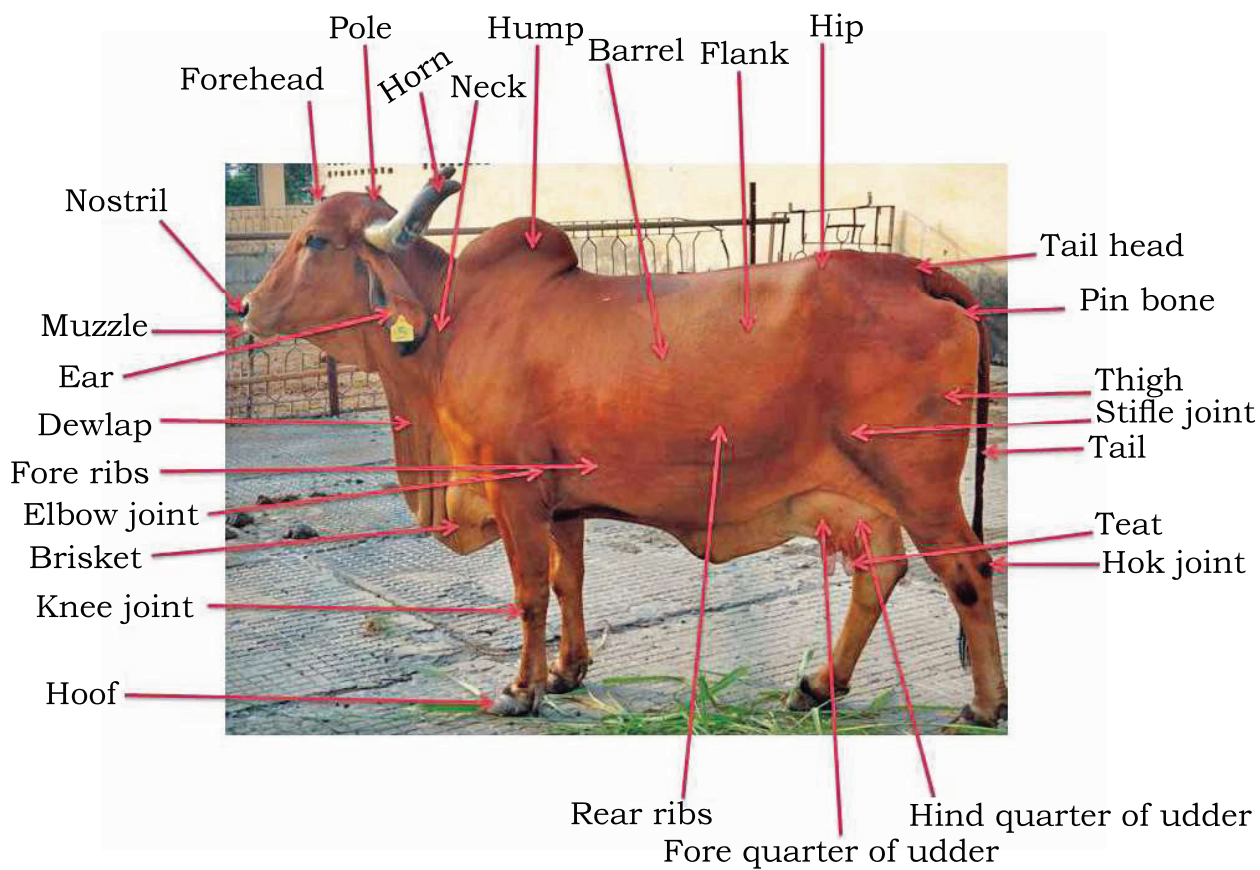


Fig. 1.2: Different body parts of cattle



Fig. 1.3 (a) Gir



Fig. 1.3 (b) Sahiwal

Fig. 1.2 shows the different body parts of cattle, which would help you in understanding the distinguishing characteristics of the different indigenous breeds.

Table 1.2: Performance of Indian milch cattle breeds

Breed	Average age at first calving (months)	Average calving interval (months)	Average lactation yield (Kg)
Gir	45	14	900–1600
Haryana	50	15	1140–4500
Sahiwal	40	15	1350–2100
Red Sindhi	44	14	1700–3400
Tharparkar	42	14	1660–2500

Exotic cattle breeds (*Bos taurus*)

Exotic breeds of cattle have been introduced in India with the objective of improving milk production. Some of the exotic cattle breeds are Holstein Friesian, Brown Swiss, Jersey and Ayrshire (Table 1.3).



Table 1.3: Exotic cattle breeds

Breed	Country of origin	Body colour	Average lactation yield (litres)	Milk fat (%)
Holstein Friesian	Holland	Black and white	6100–6200	3.5
Jersey	Island of Jersey in the English Channel	Light brown with or without white markings on the body	4000–4500	5.5
Brown Swiss	Switzerland	Distinctly brown	5200–5400	4.0
Ayrshire	Scotland	Light to deep cherry red with or without white markings on the body	4800–5000	4.1



Fig. 1.3 (c) Tharparkar



Fig. 1.3 (d) Red Sindhi

Fig.1.3 (a–d): Some indigenous breeds of milch cattle



Fig. 1.4 (a) Holstein Friesian



Fig. 1.4 (b) Jersey



Fig. 1.4 (c) Brown Swiss



Fig. 1.4 (d) Ayrshire

Fig. 1.4 (a–d): Some important exotic breeds of cattle

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Crossbred cattle

Cross-breeding of cattle means the mating of animals from different established breeds, for example, Holstein Friesian with Sahiwal. The progeny of cross-breeding is called crossbred, which exhibits a mixture of qualities of both the parent breeds. The programme of cross-breeding of dairy cattle has played a role in increasing milk production in India. Important crossbred cattle developed in India are mentioned in Table 1.4.

Table 1.4: Popular crossbred cattle available in India

Name of the crossbreed	Cross between		Place of origin
	Indigenous breed (female)	Exotic breed (male)	
Sunandini	Local cows	Brown Swiss	Kerala
Karan Swiss	Sahiwal and Red Sindhi	Brown Swiss	Haryana
Frieswal	Sahiwal	Holstein Friesian	Military dairy farms
Karan Fries	Tharparkar	Holstein Friesian	Haryana
Phule Triveni	Gir	Holstein Friesian, Jersey	Maharashtra

Indian buffalo breeds

There are two general types of buffaloes, *viz.*, swamp buffaloes and river buffaloes. Major buffalo population of India are of river buffalo type. India can take pride in having the best buffalo breeds in the world. Buffaloes are present in almost every part of India and can be considered the backbone of the milk supply and milk processing industry in India. About half of the total milk produced in the country is contributed by buffaloes, although their population is almost half of the cow population. There are 13 well-known indigenous breeds of buffaloes in India.

Out of the two types of buffaloes—swamp and river buffaloes—the swamp buffalo prefers marshy lands, where it wallows in mud and feeds on coarse marsh grass. They are predominantly found in parts



of Assam, Nagaland, Manipur and Mizoram, and are of non-descript type. The river buffaloes prefer clean water of rivers, irrigation canals and ponds to wallow. They are docile in nature, and extensively reared for high-fat percentage milk. Some of the important breeds of river buffaloes are Murrah, Nili-Ravi, Surti, Mehsana, Jaffarabadi and Bhadawari. Table 1.5 mentions the habitat and characteristics of major buffalo breeds of India. Table 1.6 shows the performance of important buffalo breeds of India.

Table 1.5: Habitat and characteristics of major buffalo breeds of India

Breeds	Breeding tract/ Habitat	Horn characteristics
Murrah	Rohtak, Jind, Hisar, Bhiwani, Sonapat districts of Haryana	Flat, short, tightly spirally curving inwards
Nili-Ravi	Ferozpur district of Punjab	Small and coiled tightly
Surti	Kaira and Baroda districts of Gujarat	Flat and sickle-shaped and form a hook at the tip
Jaffarabadi	Kutch, Junagarh and Jamnagar districts of Gujarat	Heavy horns, inclined to droop at each side of the neck and then turn up (drooping horns)
Mehsana	Mehsana, Sabarkantha and Banaskantha districts of Gujarat	Curled at the tip but not so much as in Murrah breed. Horns are longer than Murrah and sometimes of irregular shape.
Banni	Kutch district of Gujarat	Vertically upward with inverted single or double coils
Bhadawari	Agra and Etawah districts of Uttar Pradesh and Gwalior district of Madhya Pradesh	Curl slightly outwards



Fig. 1.5 (a) Murrah



Fig. 1.5 (b) Jaffarabadi



Fig. 1.5 (c) Bhadawari



Fig. 1.5 (d) Surti



Fig. 1.5 (e) Nili-Ravi



Fig. 1.5 (f) Mehsana



Fig. 1.5 (g) Nagpuri

Fig. 1.5 (a–g): Some important breeds of buffalo

Nagpuri	Nagpur, Akola and Amravati districts of Maharashtra	Long and sword-shaped
Marathwadi	Beed, Parbhani, Jalna, parts of Nanded, Latur, Hingoli and Osmanabad districts of Marathwada region of Maharashtra	Mostly round, short, parallel to the neck and not extended beyond the hump
Pandharpuri	Solapur, Sangli and Kolhapur districts of Maharashtra	Long, sword-shaped, sometimes twisted
Kalahandi	Eastern part of Andhra Pradesh and adjoining areas of Odisha	Broad and half curved running backwards towards the tip of the horn
Chilika	Surrounding area of Chilika lake in Odisha	With age, the horns grow upwards, lateral and finally in a typical sickle shape.
Toda	Nilgiri hills of Tamil Nadu	The horns are wide apart, curving inwards and then outwards, forming a crescent shape.

Table 1.6: Performance of important buffalo breeds of India

Breed	Age at first calving (months)	Calving interval (months)	Average lactation yield (litres)	Milk fat (%)
Murrah	44	15	1000–2050	6.9–8.3
Jaffarabadi	45	15	2150–2340	6.8–8.5
Bhadawari	45	13–16	540–1400	6.0–12.8
Surti	45	15	1650	7–8
Nili-Ravi	40–53	15	1600–1900	5.1–8.0
Mehsana	43	16	2000	5.2–9.5
Nagpuri	57	14	760–1500	7.0–8.8

Source: Animal Genetic Resources of India (<http://www.nbagr.res.in/nbagr.html>)



Practical Exercise

NOTES

Activity 1: Identify the various breeds of cows and buffaloes in a dairy farm.

Material required

Chart of different breeds of cow and buffalo showing typical characteristics

Procedure

- With the help of the dairy workers of the farm, examine and record the various characteristics of the dairy animals. Identify the different breeds of cows and buffaloes being maintained at the farm.

Check Your Progress

A. Multiple choice questions

1. Which of the following is not an exotic breed of cattle?
(a) Jersey (b) Holstein Friesian
(c) Tharparkar (d) Brown Swiss
2. Which of the following is a breed of buffalo?
(a) Murrah (b) Sahiwal
(c) Tharparkar (d) Gir
3. Which of the following is not an crossbred cow?
(a) Karan Swiss (b) Karan Fries
(c) Sunandini (d) Gir
4. Where is the pole located?
(a) in the base of the tail (b) in the flank region
(c) in between two horns (d) None of these
5. In which state is the Toda breed of buffalo found?
(a) Haryana (b) Tamil Nadu
(c) Maharashtra (d) Punjab

B. Fill in the blanks

1. _____ cattle are developed from the indigenous and exotic breeds.
2. _____ is considered the best buffalo breed in terms of milk production.
3. Sunandini breed of cow is found in _____.
4. The _____ breed of buffalo usually has sickle-shaped horn.
5. The scientific name of exotic cattle is _____.

C. Mark true or false

1. Exotic cattle breeds have higher milk production potential.
2. Exotic breeds are well adapted to the Indian conditions.
3. Jaffarabadi buffalo breed is mainly found in Gujarat and Rajasthan.
4. Jersey breed of cow is mainly found in Canada.
5. Brown Swiss breed of cow originated in Turkey.

D. Match the following

- | A | B |
|----------------|-------------------|
| 1. Sahiwal | (a) Gujarat |
| 2. Mehsana | (b) Switzerland |
| 3. Sunandini | (c) Punjab |
| 4. Bhadawari | (d) Kerala |
| 5. Brown Swiss | (e) Uttar Pradesh |

E. Crossword

2		5 J	4		
	6 M		U		3 T
1 M				A	
P	Z	S	T		I
			I		G
	L				

Across

1. A breed of buffalo found in Rohtak, Jind, Hisar, Bhiwani and Sonapat districts of Haryana

Down

2. Part of body found in indigenous cattle
3. Part of hind leg of cattle
4. Famous buffalo breed of Gujarat
5. Popular exotic cattle breed for Indian dairy farmers
6. Part of mouth of cattle

GLOSSARY

Crossbred animals: Animals produced by crossing indigenous breeds with exotic breeds.

Dairy: A business enterprise established for the production and processing of milk for human consumption.

Dairy animals: Animals reared for milk production.

Dairy farmer: One who manages dairy animals and milking operations to ensure maximum milk production. The responsibilities vary according to the size and type of operations.

Draft/Draught animal: The males of domestic cattle used for drawing heavy loads and other farming operations such as ploughing.

Exotic cattle: Cattle breeds developed in other countries such as Jersey and Holstein Friesian.

Indigenous cattle: Breeds of cattle originated in India with a distinctive hump.

Livestock: Domestic animals such as cow, buffalo, goat, sheep, swine, poultry, horse, etc., reared for home use or for profit, especially on a farm.

Wallowing: Rolling of buffaloes in mud and water to keep their body cool and to avoid biting insects.



Unit

2



Livestock Accommodation

INTRODUCTION

Proper housing based on scientific principles is an important aspect of dairy animal management for obtaining maximum productivity of the animals. A clean and comfortable shelter increases the comfort level of the animals and results in their good health. The essential criteria for housing dairy animals includes animal health and comfort, hygiene, protection from predators, theft and diseases, efficient and economical use of labour and provision of suitable environment for hygienic milk production. In the absence of proper housing, animals are exposed to extreme temperature, wind, cold, rain, snowfall, etc., which adversely affect their health, production and reproduction. This Unit discusses the various aspects of dairy animal housing along with disposal of manure to maintain healthy environment in the dairy farm.

SESSION 1: BASICS OF ANIMAL HOUSING

The efficient management of dairy animal is incomplete without a well-planned housing (Fig. 2.1).

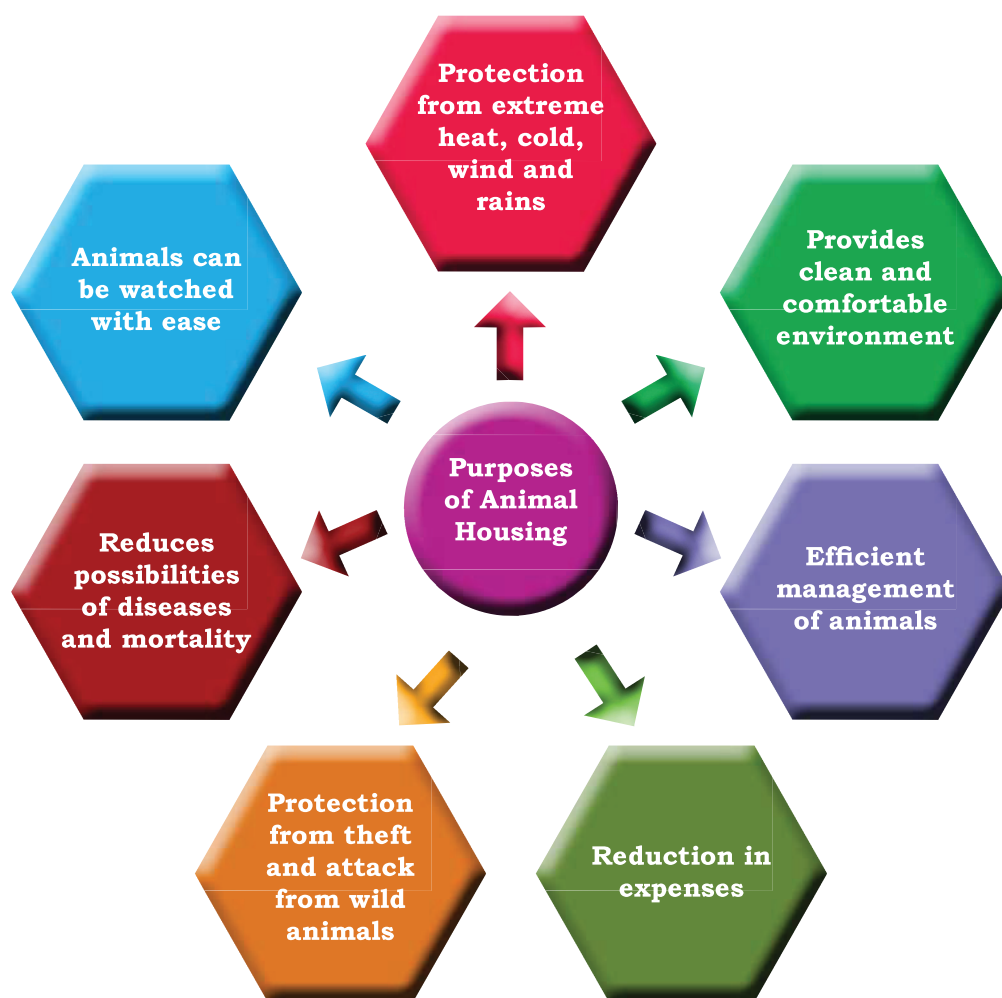


Fig. 2.1: Purposes of animal housing

Key aspects of animal housing

Six important aspects of livestock housing are as follows.

1. *Space*: Availability of sufficiently spacious area allows the animals to move freely and gives them easy access to feed and water.
2. *Feed*: Arrangements are made in housing so that animals can eat a palatable and well-formulated feed. The feed is available daily for at least 21 hours.
3. *Water*: Accessibility of clean water for at least 21 hours daily.
4. *Air*: Access to fresh and clean air.



5. *Light*: Availability of sufficient natural light and provision to maintain six hours of darkness for farm animals are essential for optimum production.
6. *Rest*: Sufficient dry and comfortable space for taking rest and lying down for at least 13 hours per day.

Types of livestock housing

The classification of various types of housing system are given in Fig. 2.2.

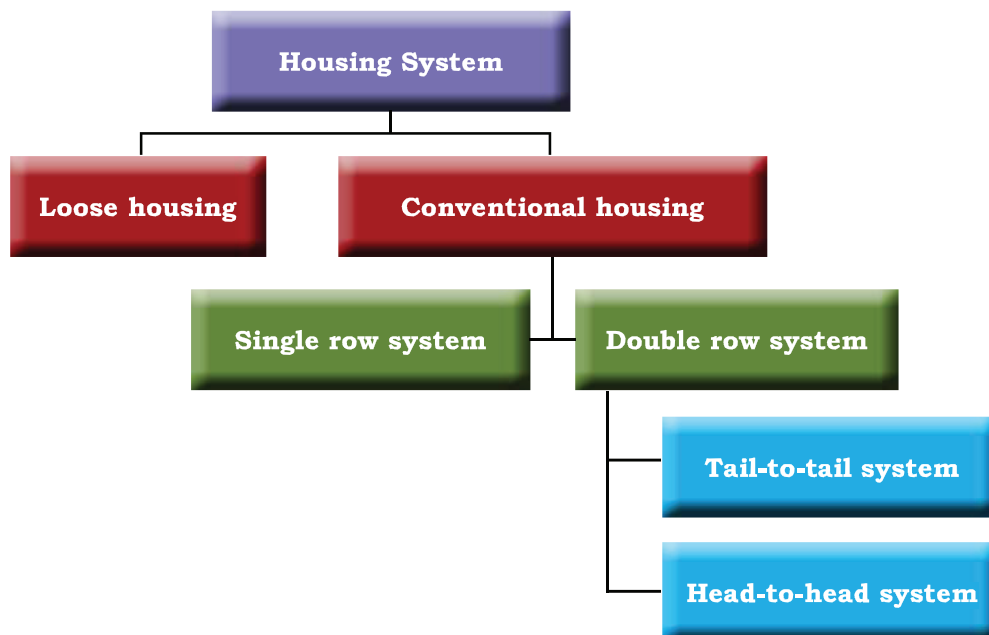


Fig. 2.2: Types of livestock housing

Loose housing system

In this system of housing, animals are kept loose in an open area in groups, during the day and night, except for specific purposes like milking, treatment and breeding. A loose housing layout has an open area and a resting area.

The open area has a covered shed on one side (Fig. 2.3) under which the animals can retire during



Fig. 2.3: Cattle kept under loose house system



Fig. 2.4: Buffaloes kept in a loose house system with common manger



Fig. 2.5: A view of loose housing for livestock

excessive heat, cold, rains, etc. In this system of housing, feed and fodder is offered in a common manger (Fig. 2.4) and water is provided in common water troughs. The total area is protected by a compound wall or fencing of minimum 5 feet height (Fig. 2.5). There is a separate milking parlour with facilities for milking of animals.

This system is ideal for areas of low rainfall such as the states of Punjab, Haryana, Rajasthan, western Uttar Pradesh and parts of Gujarat, Madhya Pradesh and Maharashtra. In other areas, this system can be used after making minor modifications as per the requirement.

Flooring in loose housing system

The floor of the dairy animal shed is made of waterproof material which can be easily cleaned and dried so that it is not slippery. Paving with bricks or grooved cement concrete floor can be used for this purpose.

Insufficient space results in overcrowding of animals, which can lead to abnormal behaviour, decreased body weight gain and drop in their overall performance. Table 2.1 shows the floor space requirement for various categories of animals under loose housing system.



Table 2.1: Suggested floor space requirement for loose housing as per Bureau of Indian Standards (BIS)

Type of animals	Floor space required (m ²)		Maximum no. of animals in each group	Height of shed at eaves
	Covered area	Open area/paddock		
Cow	3.5	7.0	40	175 cm in medium and heavy rainfall areas and 220 cm in semi-arid and arid areas.
Buffalo (female)	4.0	8.0	40	
Bull	12.0	24.0	1	
Down calver	12.0	12.0	1	
Young animal (beyond one year)	2.0	4.0	30	
Calf (below one year)	1.0	2.0	30	

Mangers and water troughs

For optimum output from animals, adequate space is required so that animals have free access to feed and water round the clock. The water troughs are located near the feeding area and seldom in the resting area. Mangers and water troughs are constructed with reinforced cement concrete, or brick with cement mortar or stone slabs with cement joining. The mangers need to have smooth surfaces for easy cleaning and easy intake of feed by the animals. Feeding and watering space requirements are given in Table 2.2. Water depth is kept at a minimum of 3 inches to enable the animal to submerge its muzzle 1 to 2 inches deep in the water trough. Separate watering point is provided for every 15 to 20 cows. In very young calves, water is never given when milk or milk replacer is fed, to avoid interference with digestion of milk (curd formation).

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Table 2.2: Suggested feeding and watering space requirements

Types of Animal	Linear length per animal (metres)	Total manger length (metres) per 100 animals	Water troughs (metres) per 100 animals	Dimensions of manger/water trough		
				Height of wall (cm)	Depth (cm)	Width (cm)
Adult cows and buffaloes	0.6–0.7	60–75	6.0–7.5	60	40	50
Calves	0.4–0.5	40–60	4.0–5.0	40	15	20



Fig. 2.6: Bedding in the resting area

Resting area

The resting area is a building or enclosure where cattle can rest or lie down on a dry bed. It provides shelter from cold winds, snow, rain and extremes of weather, and is always roofed. Resting area is not used as a waiting or exit area for the milking parlour. Feeding and watering is never provided in the resting area.

Bedding material for resting area

Bedding is provided to the animals to keep them clean and comfortable. It absorbs liquid manure. The usual bedding material are wheat straw, rice straw and sawdust. The desirable qualities of the bedding material are bulkiness and large liquid absorption capacity. On an average, 2 to 3 kg of straw per cow per day is required for bedding. Cemented floors are usually preferred, however, earthen floors could be considered for resting areas, provided they are 8 to 12 inches above the ground level and sloped away from the building to provide good drainage.

Benefits of loose housing system

The loose housing system involves low cost of construction and maintenance, provides more comfort to animals, ensures easier detection of oestrus and better labour efficiency, as compared to the conventional housing system. Fig. 2.7 mentions various benefits of loose housing system.



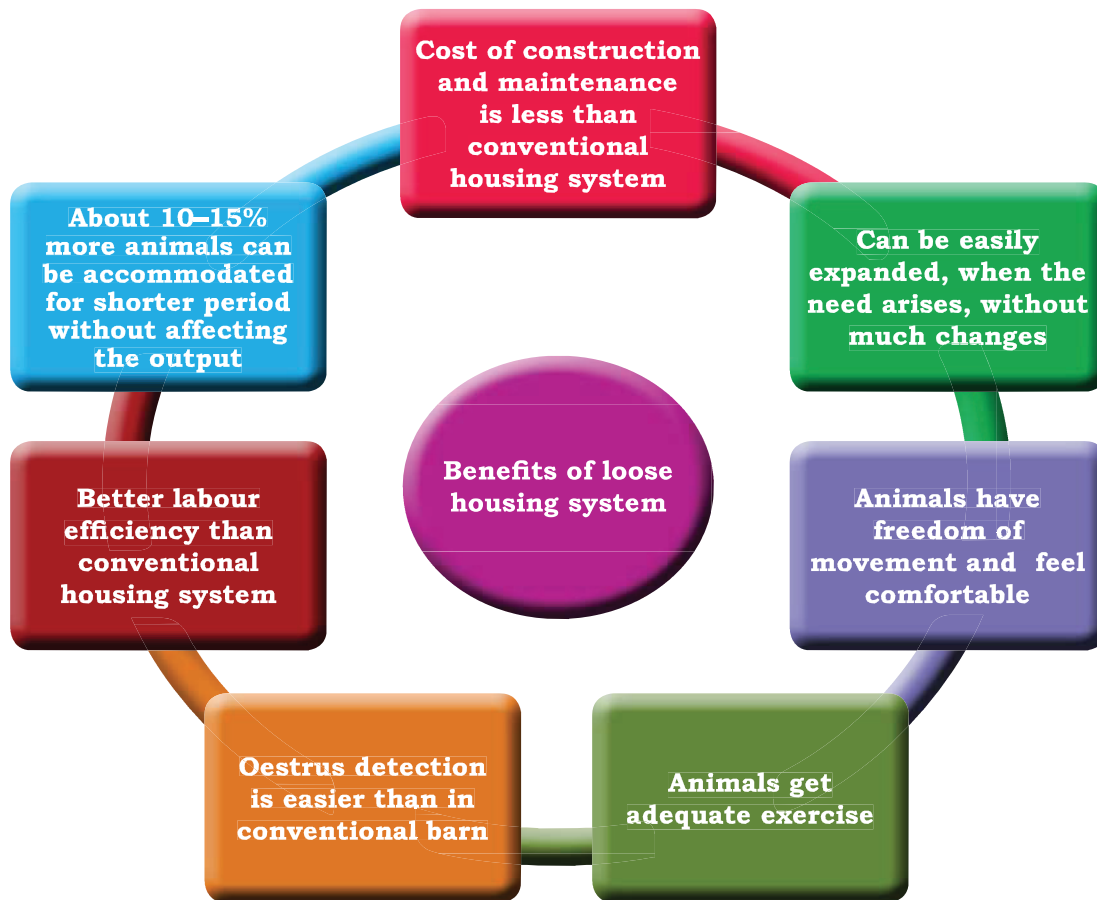


Fig. 2.7: Benefits of loose housing system

Conventional housing system

In this system, animals are tied in a stall for feeding, watering, milking and resting. They are confined together within the shed and tied by neck chains. The barns are completely roofed and the walls have windows and ventilators. The distance between two sheds is generally not less than 30 feet. The feed is delivered in a trough in front of the animals, and they are milked individually in the stall using buckets. The manure is collected in a gutter. This type of housing is most suited for temperate regions, as it protects the animals from heavy snowfall, rains and strong winds. The conventional barns provide better protection when winter is prolonged and severe. However, there are a few disadvantages of conventional housing system, for example, if the cattle are tied up all year round, their feet become stiff and could lead to feet problems. Also, oestrus in cattle is difficult to detect.

Cattle shed

The arrangement of the animals within a shed depends upon the number of animals to be accommodated. It is advised to have a single row system when the number of animals is up to 10. When the number of animals exceeds 10, the double row system is desirable. Generally, one shed can accommodate 50–60 cattle. However, modern management system allows one shed to accommodate even 100 cows. In double row housing, either the cattle face out from each other (tail-to-tail system) or face in towards each other (head-to-head system). Each animal is provided a separate manger.



Fig. 2.8: Tail-to-tail housing system

Tail-to-tail system of housing

In this system, the animals are tied in the shed in opposite direction (Fig. 2.8). The cleaning of sheds and milking of cows is easy and chances of disease transmission from animal to animal are also reduced. Under this system, problems in hind quarters of animals can be detected easily, as compared to loose system of housing. Animals get fresh air directly and the milking process can be effectively supervised (Fig. 2.9).



Fig. 2.9: Benefits of tail-to-tail housing system



Head-to-head system of housing

In this system, animals are tied in such a way that they stand facing each other. This makes it easy for the animals to go to their stalls, and feed with ease, thus enabling better management. The morning sunlight falls maximum on the gutter, which improves the overall hygiene of the shed (Fig. 2.10). The various benefits of head-to-head system are mentioned in Fig. 2.11.



Fig. 2.10: Head-to-head housing system

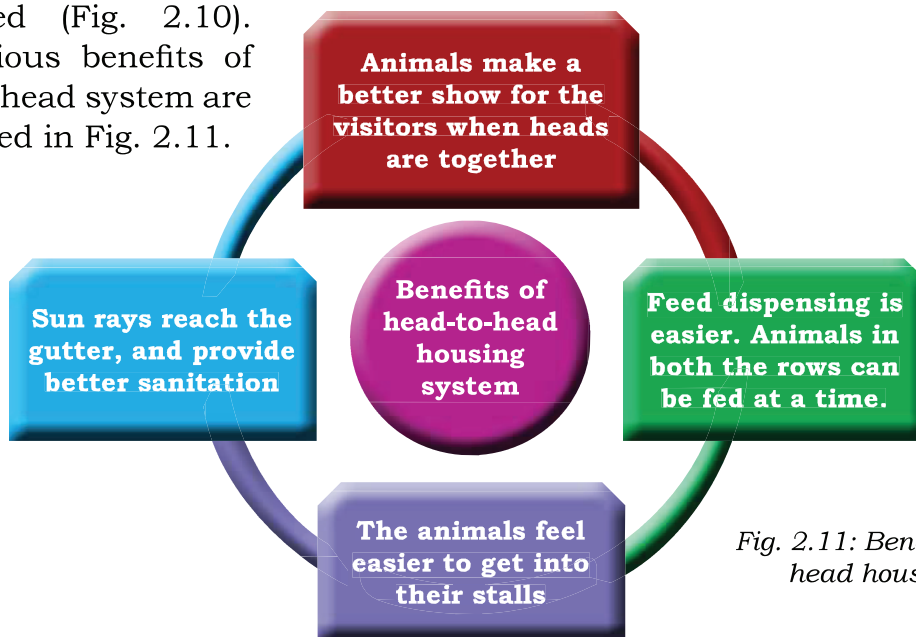


Fig. 2.11: Benefits of head-to-head housing system

Equipment and machinery required for livestock housing

The type and number of equipment and machinery required in a dairy farm depends on the level of mechanisation and the total number of animals. However, some of the essential machinery and tools are chaff cutters, milking utensils and other minor implements, which are required irrespective of the number of animals.

If the dairy farm is situated in an area with extreme weather conditions, cooling and heating devices are required, especially for young calves, ill, injured and

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pregnant animals. In case the number of milch animals exceeds 50, milk cooling devices, generator set and a utility vehicle are also essential for storage and selling of milk, etc. If you are interested in keeping a large number of animals, it is better to have some area designated for fodder cultivation. In this case, farm equipment like tractor, seed sowing, fodder harvesting and processing equipment are also required.

A list of equipment and machinery required for small and medium sized dairy farm is as follows (Table 2.3).

Table 2.3: Equipment and machinery used in small and medium sized dairy farms

Section	Equipment and machinery
Fodder production	Tractor
	Trolley
	Large weigh bridge
Feed processing	Fodder-reaper-cum-binder
	Chaff cutter (manual or motor-operated)
	Feed grinder
Dairy section	Feed mixer
	Cooling system
	Heating system
	Generator
	Tubewell with motor
	Milking machine
	Animal weigh bridge
	Electrical dehorner
	Burdizzo castrator
	Tagging set
	Branding numbers
	Drenching bottle
	Hoof trimmer
	Ropes, fire controlling equipment, iron chains, etc.

Fig. 2.12 (a-i) shows some common machinery and equipment used in a dairy farm.



Fig. 2.12 (a)

Platform type electronic animal weigh bridge: It is used to measure the body weight of animals.



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Fig. 2.12 (b)

Bull leader: It is used for controlling the bull.



Fig. 2.12 (c)

Electrical dehorner: It is used for disbudding the horns in young calves.



Fig. 2.12 (d)

Drenching bottle (Metal): It is used for application of medicine through oral route.



Fig. 2.12 (e)

Bull nose ring: Nose rings are inserted through the nasal septum of bull, which help in controlling them.



Fig. 2.12 (f)

Ear tags and tag applicator: These are used for fixing tags in the ears, for easy identification of animals.



Fig. 2.12 (g)

Branding numbers: These numbers are stamped behind the right hip of the animal, for easier identification of the cattle.



Fig. 2.12 (h)

Burdizzo castrator: As the name suggests, it is used for castrating male calves.



Fig. 2.12 (i)

Hoof trimmer: It is used for trimming the hooves of cattle.

Fig. 2.12 (a-i): Common machinery and equipment used in dairy farms

Standard workplace procedures followed in a dairy farm

Dairying is a 365 days a year all-weather activity, and therefore, it is not feasible for a dairy entrepreneur to supervise all operations of the dairy farm round the clock. Critical tasks such as operating milking machines, oestrus detection and many other aspects of dairy farming cannot be easily measured and therefore have been mechanised.

Routine activities of a dairy farm

Various routine activities of a dairy farm are classified in three major groups, i.e., daily routine, monthly routine and quarterly or yearly routine (Fig. 2.13).

Daily routine

- Milking
- Cleaning of sheds
- Cleaning of mangers
- Cleaning of milking utensils
- Feed preparation
- Feed distribution
- Routine treatments of animals
- Oestrus detection
- Artificial insemination
- Checking of balance of feedstock
- Recording of various types of data on a daily basis

Monthly routine

- Cleaning and painting of water troughs
- Thorough cleaning of farm premises
- Checking of all equipment and machinery
- Oiling and greasing of equipment and machinery
- Repairing of wear and tear inside the animal shed

Quarterly or yearly routine

- Vaccination
- Deworming
- Major repairs of farm building and premises

Fig. 2.13: Various routine activities of a dairy farm



Practical Exercise

Activity 1: Examine the housing design of a nearby dairy farm.

Material required

Measuring tape, Camera, Notebook

Procedure

1. Visit a nearby dairy farm.
2. Note down the various structures existing at the dairy farm, and examine them.
3. Draw a sketch-map of the dairy farm.

Check Your Progress

A. Multiple choice questions

1. The advantage of head-to-head system of livestock housing is _____.
(a) easier supervision of milking
(b) animals get more fresh air from outside
(c) feed dispensing is easier, both rows can be fed at a time
(d) None of the above
2. For adult buffaloes, floor space requirement (m^2) under covered area is _____.
(a) 3.5 (b) 4.0
(c) 7.0 (d) 8.0
3. Loose housing system is suitable for which of the following states?
(a) Punjab (b) Rajasthan
(c) Maharashtra (d) All of these
4. Which of the following housing system is suitable for temperate regions?
(a) Loose housing (b) Conventional housing
(c) Both (a) and (b) (d) None of these
5. Which of the following machinery is used in fodder production?
(a) Tractor (b) Reaper-cum-binder
(c) Cultivator (d) All of these

B. Fill in the blanks

1. A loose housing system has open area or paddock and _____ area.
2. In a loose house, the height of the fencing is not less than _____.
3. The single row system is advisable when the number of animals is up to _____.
4. In conventional barns, the distance between two sheds is not less than _____.
5. Burdizzo castrator is used for _____.

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C. Mark true or false

1. Improper arrangements in animal sheds may result in additional expenditure on labour.
2. In conventional housing system, each animal is provided with a separate manger in the barn.
3. Heat detection is easy to carry out in a conventional barn.
4. In the loose housing system, animals are kept loose in the shed.
5. In big farms, it is always economical to purchase fodder from the market.

D. Match the following

- | A | B |
|-----------------------|--------------------------------|
| 1. Drenching bottle | (a) Identification |
| 2. Burdizzo castrator | (b) Administration of medicine |
| 3. Dehorner | (c) Castration |
| 4. Bull nose ring | (d) Dehorning |
| 5. Branding numbers | (e) Controlling of bull |

E. Crossword

	² P			³ B	
¹ M			G		⁴
	D			D	O
					D
R	C				
E	K			G	

Across

1. The designated area for feeding animals.

Down

1. Mixture of cow dung, leftover feed and other organic matter in a dairy farm.
2. Open area for the animals
3. Used within the animal shed which provides comfort to the animals.
4. Structure essential to move things from one place to another within a farm.

SESSION 2: HOUSING LAYOUT FOR DAIRY ANIMALS

Housing for animals is designed in such a way that it can accommodate animals of all age groups separately. At the same time, the animal house facilitates various farm activities such as milking, feeding and cleaning in a safe



and efficient manner. The animal house also provides comfort to the animals for optimal milk production and protection against unfavourable weather conditions (for example, heat, rain and wind). The animal house is constructed based on certain principles which are mentioned in Fig. 2.14.

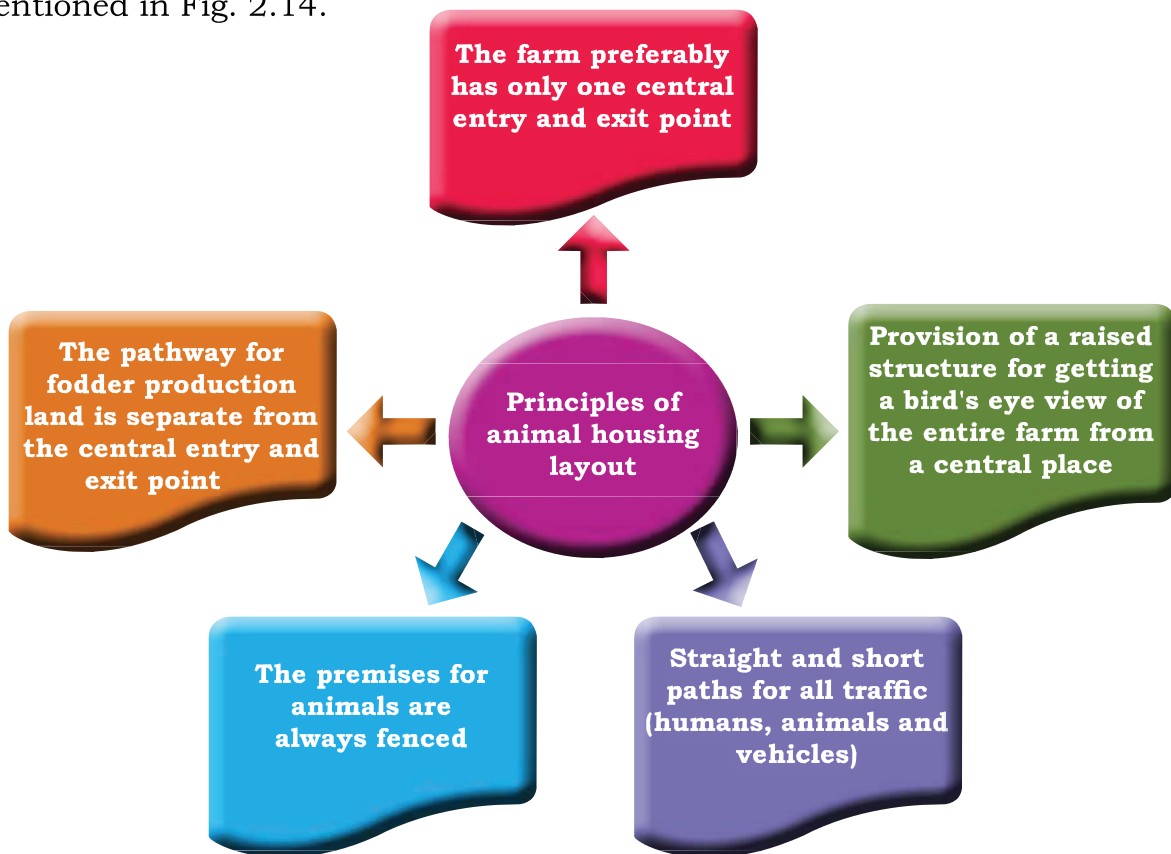


Fig. 2.14: Principles of animal housing layout

Grouping of cattle in a herd

A dairy farmer divides the dairy herd into different groups, especially when the size of the dairy farm is large. The grouping of the animals is based on the nutritional as well as operational requirements. Animals can be categorised as heifers, lactating cows (early, mid and late), dry cows, advanced pregnant cows, sick animals, breeding bulls, suckling calves and young calves. Appropriate grouping of animals reduces labour requirement, chances of fighting among the animals and helps in their better management. The various terms used for different categories of cows and buffaloes are described in Table 2.4.

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Table 2.4: Various terms for different categories of cows and buffaloes

Category of animal	Cow	Buffalo
Adult male	Bull	Buffalo bull
Adult female	Cow	She buffalo
Newborn (up to one year)	Calf	Buffalo calf
Male (above one year and up to sexual maturity)	Yearling/ young male	Yearling buffalo/ buffalo young male
Female (above one year and up to first calving)	Heifer	Buffalo heifer
Castrated male	Bullock	Buffalo bullock
Act of parturition	Calving	Calving
Act of mating	Servicing	Servicing
Group of animals	Herd	Herd

Layout of animal housing

A large dairy farm has three essential sections—cattle section, dairy section and fodder production section. The various structures associated with these sections are given in Table 2.5.

Table 2.5: Important sections of a dairy farm

Cattle section	Animal shed	Milking animal shed
		Dry animal shed
		Calving box or calving pen
		Heifer shed
		Calf shed
		Bull shed
		Milking parlour
		Sick animal shed
	Ancillary structure	Artificial insemination-cum-veterinary dispensary
		Concentrate godown
		Dry fodder godown
		Chaffing shed
		Handling yard
		Manure disposal area
		Silo
		Trevis
		Wallowing tank



Dairy section		Milk collection room
		Milking utensils storage room
Fodder production section		Implements and workshop shed
		Fertiliser and fodder seed storage room

Layout plan of a large dairy farm

The layout plan of a large dairy farm as per the Bureau of Indian Standards is given in Fig. 2.15.

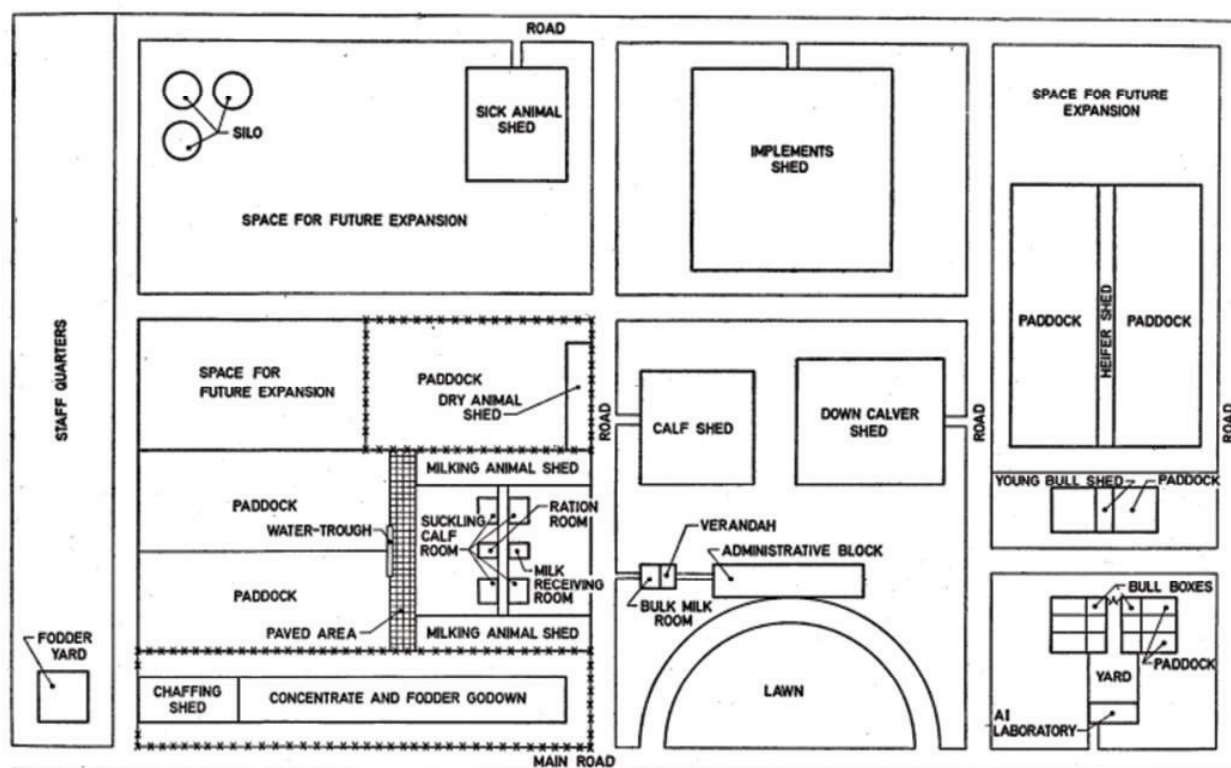


Fig. 2.15: Layout plan of a large dairy farm (Bureau of Indian Standards)

Cattle section

This is the most important section in a dairy farm. It has various units which are planned in such a way that they provide comfort and protection to the animals and operational convenience to the farm workers.

Animal shed

Milch animal shed

The length and width of the floor area of the milch animal shed is calculated on the basis of the average size of

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animals. 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 height and it gradually reduces to 1 mm towards both the sides. There are two drains laid on either side of the central passage in tail-to-tail system. There are two continuous mangers on the outer side of the area. The floor has the slope ratio of 1 in 40 towards the drainage.

Milking parlour

The cattle are milked in the milking parlour which is a separate structure in the dairy farm. The milking parlour is a must when the animals are maintained in loose housing system. Animals are brought to the milking parlour for milking and after that, they are taken back to the feeding or resting area. The milking parlour is usually a part of a larger complex known as the milking centre, which houses supporting structures and equipment for the parlour. A milking centre consists of the following.

Holding area: A paved area is provided just outside the milking parlour entrance to hold the cattle till they are to be milked. It may be open or covered area. 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: The room is used for storing milk and equipment meant for cooling, cleaning and sanitising the milk.

Utility room: In this room, equipment such as vacuum pumps, refrigeration compressors and water heaters are kept.

The dimensions of various units of milking parlour are given in Table 2.6.

Double rows of standing can be arranged either in tail-to-tail or head-to-head system. For the purpose of milking, the tail-to-tail arrangement is comparatively better than the head-to-head system. The milking parlour can be used for milking in two–three shifts depending upon the system of milking (hand milking or machine milking).





Fig. 2.16: Fully automatic milking parlour at NDRI-Karnal

Therefore, the size of the milking parlour is such that it can accommodate half to one-third of the total number of milking animals at a time.

Table 2.6: Dimensions of milking parlour

Length of standing space	1.5 –1.7 metres
Width of standing space	1.05–1.2 metres
Width of central passage	1.5–1.8 metres
Width of feed alley	0.75 metre
Width of gutter	0.30 metre
Width of manger	1.40 metres

Dry animal shed

The shed for dry animals may be of loose housing type and consist of a centrally placed manger under a roof in the paddock. The manger is surrounded by a 2.2 metre-wide paved platform with drainage.

Calving pens

Although cattle prefer to live in herds, however, at the time of giving birth, they like a quiet place away from the disturbance



Fig. 2.17: A cleaned milking parlour suitable for hand milking



Fig. 2.18: Closed area of calving pen



Fig. 2.19: Open area of calving pen

of the herd and farm workers. After calving, the animal needs to be with her calf to establish a bond with the newly born calf. In a conventional housing system, cattle generally remain in the same barn while giving birth. However, in a loose housing system, the cattle is isolated from the herd and placed in an individual calving pen. The calving pen is sufficiently spacious, well lit, draught-free and easy to reach and clean. Two to three weeks before the expected date of calving, the animals are shifted to a calving pen. Such animals remain in the calving pen up to 3 to 5 days after calving.

There is one calving pen for every 20 animals, i.e., 5 per cent of the breedable animals. In advanced pregnancy, animals are housed in loose boxes enclosed from all sides with a door. Such accommodation has an area of about 12 square metres with ample soft bedding. Sand can also be used as bedding material with a minimum height of 30 centimetres. The floor of the calving pen is made non-slippery and each pen is connected to an independent drain. The closed and open area of calving pen is shown in Figs. 2.18 and 2.19.

Calf shed

Newborn calves are individually housed during the first few weeks. Since a calf is quite susceptible to all kinds of infections, the death rate is highest in the initial weeks. Therefore special attention is paid to hygiene and climatic conditions. The calves are housed in individual pens up to the age of eight weeks and then they are placed in group housing system.

Individual housing for calves: Calves are housed separately because they have a natural tendency of suckling, in the absence of such stimulus they have a tendency of cross-suckling (suck one another), which can cause easy transmission of diseases in them. Individual



pens for calves help in feeding them individually, for easy observation and keeping a check on diseases. The pens are constructed in such a manner that the calves can see and hear the other calves. Thus, a single pen has open or partly open sides. The height of the partition of the pens is about 75 cm. Feeding box is attached to the gate which facilitates feeding of calf starter to them (Fig. 2.21).

Group housing for calves: After rearing the calves in individual pens for about two months, they are housed in groups of 3–5 calves per pen, preferably on straw bedding. Calves are never accommodated with adults in the cattle shed. The calf house has provisions for daylight, proper ventilation and good drainage, as damp and wet floors can make calves susceptible to respiratory problems.

For better management of calves, they are classified into three groups—(a) below one month of age, (b) below the age of 3 months, and (c) 3 to 6 months old and those over 6 months. The floor space requirement per calf is about 20–25 square feet for calves below 3 months and 30 square feet for those in the 3–6 months age group. The whole area of the calf shed including paddock is well protected from birds as they can create wounds by pecking the calves.

Housing for heifers and young males

A heifer is a young female cattle over one year of age until first calving. A young male cattle over one year of age until sexual maturity is known as young male. As a standard practice, the heifers are housed separately from young males, otherwise undesirable mating may occur.

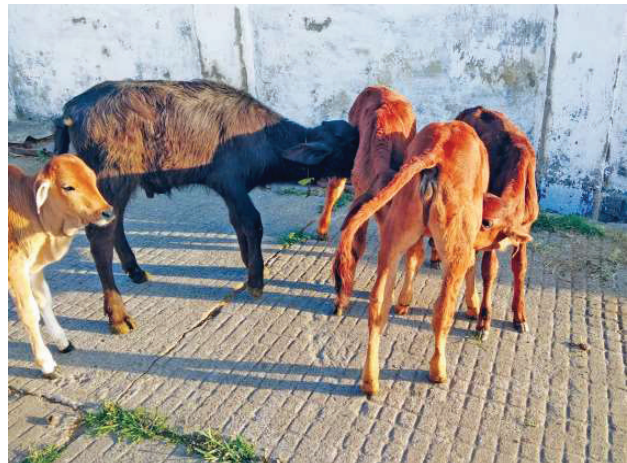


Fig. 2.20: Calves showing cross-sucking behaviour



Fig. 2.21: Individual calf pens (feeding box fitted on the door)



Fig. 2.22: Growing calves (approx. 4–6 months of age) housed in a group

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Bull shed

Breeding bulls are always maintained in individual pens, to allow them sufficient open space for free movement. If bulls are not adequately exercised, it leads to overgrowth of the hoofs creating difficulty in mounting the breedable cows. This also causes a loss in the breeding efficiency of the bull. The shed for bulls has mangers and a water trough. From its shed, the bull can see other animals of the herd so that it does not feel isolated. The bull shed is provided with a strong fence or a boundary wall of about 4 feet height.

Ancillary structures

The secondary structures which are useful for day-to-day farm operations are called ancillary structures, and these are useful for both loose and conventional systems of animal housing. The size and number of different ancillary structures depends on the herd size. The various ancillary structures are described below.

Artificial insemination (AI) laboratory

Adjacent to a bull shed, there is a 10 x 10 metre service yard with a service crate for the collection of semen. The AI laboratory is attached to the service yard where testing, processing and storage of semen is carried out. The minimum dimensions for laboratory are 3 x 4 metres. An area of 3 x 4 metre each is required for wash-up room and room for supervising staff.

Trevis

Trevis is used for purposes of both treatment and artificial insemination of cattle. It is a U-shaped structure made of 2 inches diameter galvanised steel pipes supported by five or seven pillars. One horizontal pipe is welded on the sides across the two rear pillars to protect the working technician from sidekicks by the animal. One adjustable pipe is put across the last two pillars through the clamps fixed on both sides of these pillars to prevent the animals from going back out of the trevis. One iron ring for tying the animal is provided at the top of front pillar to prevent the animal from jumping off. Two different types of trevis are shown in Figs. 2.23 and 2.24.





Fig. 2.23: Trevis



Fig. 2.24: Cow inside the trevis for examination

Casting pit

It is the area where animals are forced to lie down for treatment or other purposes. In large farms, it is desirable and economical to construct one casting pit that can be used for vaccination and treatment of animals. The dimension of the casting pit is usually 0.31 m deep and 2.4 m high along with a diameter of 7.62 m. The casting pit contains about 15 cm of sand or saw dust or a mixture of both, which acts as a comfortable bedding material for the animals (Fig. 2.25).



Fig. 2.25: Casting pit

Sick animals' shed and veterinary dispensary

The shed for sick animals is located away from the healthy animal sheds. Each sick animal is accommodated in a single pen within the sick animal shed. The dimensions and arrangements of sick animal pens are same as for calving pens. The paddock of the sick animals is paved and regularly washed. A trevis is placed at one of the corners of the paddock. For the treatment of sick animals, a room of 3 x 4 metres is provided with a dispensing counter, shelves and two or three cupboards. It is also provided with a porcelain sink and a power plug for sterilization of material. The pharmacy has built-in shelves and cupboards and a working table. A diagnostic laboratory of 3 x 4 metres is provided adjacent to the pharmacy room.

Isolation yard

Animals suffering from infectious diseases are segregated from the rest of the herd. The number of

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isolation yards depends upon the size of the herd, and for every 40 animals one isolation yard is provided. One isolation yard can accommodate two to six animals depending upon the size of the animals. It has independent drainage which is connected to the main drainage running behind the shed, so that no animal comes in contact with potentially infected discharges, etc. The yard is suitably fenced, and provided with a manger and a water trough. A fly-proof wire netting door is provided in the yard, to avoid insects. The dimension of an isolation yard is about 5×3 metres and has a stanchion or tie-stall in one corner.

Post-mortem platform

The post-mortem platform is a raised structure of 3×4 metres with a roof. It is used for performing post-mortem examination of dead animals, and is kept at a considerable distance from the animal shed. An incinerator is provided to completely burn-off the carcass of animals suffering from contagious diseases.

Stores for concentrates and dry fodder

Another important ancillary structure of animal houses are concentrate and dry fodder stores. For uninterrupted feeding of animals, sufficient quantity of feed and fodder is kept ready in the stores. The size and type of buildings for these stores depends on the quantity of feed and fodder required to be stored on the farm. It is advisable to store sufficient amount of concentrates required for at least three months. The usual space requirement for concentrate godown is 0.2 cubic metre per animal. The concentrate store-cum-feed mixing room and the ration room are located near the milking parlour. In smaller farms, one feed store near the milking parlour could be sufficient. The structure of the feed room is made in such a way that it is damp-proof and rodent-proof.

Dry fodder such as hay or crop by-products like straws are fed to the animals on a daily basis, and therefore, facilities for their proper storage are essential. Straws are available during the harvesting season at cheaper rates, and it would be economical to store the whole quantity of straws required for the year in one go, during



the harvesting season itself. Adult animals consume about 6 kg of dry fodder per day while young animals consume about 3 kg per day, besides green fodder and concentrates. Thus, the size of the shed needed to store dry fodder can be calculated accordingly.

The size of the hay godown must meet the requirements of hay for at least two months. The annual quantity of hay required can be calculated on the basis of the number of days in a year when hay is necessary.

Ration room

In a medium-sized farm, a room of at least 3 x 4 metres is provided near the milking shed, which stores concentrates to meet the daily requirements of animals. It is important to ensure that the ration room is damp-proof and rodent-proof.

Chaffing shed

The chaffing shed is used for cutting the grasses and green fodder into very small pieces with the help of the chaffing machine, to improve the overall palatability and digestibility of the green fodder. The floor of the chaffing shed is sufficiently hard and preferably constructed in cement concrete. The floor area is at least 14 x 4 metres. A chaffing shed consists of two portions, one for storing the fodder to be chaffed, and the other portion for storing the chaffed material. The location of the chaffing shed is such that it facilitates the chaffing and removal of the chaffed fodder.



Fig. 2.26: Chaffing shed

Silos

The nutritive value of fresh green fodder is the highest and the nutritive value of the fodder decreases when it is dried. Therefore, through the process of silage, the nutritive profile of the green fodder is maintained. Silage is a method to preserve the green fodder for cows

and buffaloes for consumption at a time when green fodder is not available in required quantity. The grasses and green fodder are cut and then fermented to retain as much sugars and proteins present in them. Many microscopic organisms living in the grasses and green fodder carry out the process of fermentation to convert the green fodder and grasses into silage.

Silos are the structures meant for storing the silage. The types of silos could be tower-type, pit-type or trench-type. In India, trench-type of silos are more practicable and convenient. The silos are preferably constructed near the animal shed. They are constructed on elevated ground to provide sufficient amount of silage during the months of May to June and October to November, when there is shortage of green fodder. A silage of a good quality weighs 0.40 to 0.48 tonnes/m³. The average daily requirement of silage for adult cow and buffalo is 10–13 kg.

Wallowing tank for buffaloes

Wallowing means rolling or lying in mud or water to cool the body. It is a natural instinct of buffaloes to wallow in pond and muddy pools. Wallowing is often noticed in summer season. During high environmental temperature and humidity, buffaloes may wallow at a stretch up to 5 hours in which they completely immerse themselves into the water except nostrils and chew with half-closed eyes. Buffaloes experience summer stress as they have dark skin, sparse hair, less number of sweat glands which have less sweating ability and are deeply sited into the skin. Besides

cooling, wallowing also helps in removing ecto-parasites and other pests. It is therefore vital to have a wallowing tank (Fig. 2.27) in a buffalo farm as a mechanism for dissipation of their body heat. An average wallowing tank (40 × 60 ft) can accommodate about 100 adult buffaloes at a time. The water of the wallowing tank is changed every week.



Fig. 2.27: Wallowing tank for buffaloes



Dairy section

The primary function of the dairy farm is to produce milk. Therefore, suitable arrangement is made for hygienic handling, processing and disposal of milk. The dairy section has the following components.

Milk receiving room

Collection of milk is an important activity in the day-to-day dairy farm operations. In the milk receiving room, the milk is collected after milking, weighed and stored in cans for small periods before being transported to the bulk milk room and ultimately reaches milk plants or market. The doors and windows of the milk receiving room are made fly-proof to ensure hygiene. The flooring of the room is made impervious and wear-resistant. The dimensions of a milk receiving room depend upon the quantity of milk handled daily.



Fig. 2.28: Fly-proof milk receiving room

In a large farm, the recording-cum-milk cooling room, the room for milk utensils and equipment, and washing room are constructed separately.

Bulk milk room and ancillary structures

In a large dairy farm, there is a separate bulk milk room, the floor area of which is at least 4 x 5 m. The area of a bulk milk room depends upon the amount of milk produced per day. After the milk is collected in the milk receiving room, it is transferred in cans to the bulk milk room. The milk cans are placed here in insulated tanks filled with refrigerated water. To inhibit bacterial growth and prevent spoilage of milk, the temperature of milk is kept around 4–5°C. An office room, compressor room and utensil wash-up room are located adjacent to the bulk milk room.

Fodder production section

Continuous supply of green fodder to the ruminants like cows and buffaloes is a prerequisite for the health

and economy of the farm. The structural requirements for fodder production section are as follows.



Fig. 2.29: Entry of an implements shed

Implements and workshop shed

Implements shed is constructed to accommodate tractors and other implements used for various farm activities. The width of the shed is preferably 8 metres. The eaves project out about a metre. There is a 10 metre wide open space on three sides and 13 metres on the front side of the shed for easy turning and movement of vehicles as shown in Fig. 2.29.

Manure disposal area

Animals defecate approximately 8 per cent of their body weight in a day. Large quantities of urine, leftover feed and fodder, bedding material, etc., are simultaneously produced in a livestock farm. Animal excreta is often mixed with straw and can be used as fertiliser for soils. Proper storage of manure is an important part of manure management. The manure from cattle shed is removed at least twice a day. It can be disposed of either in solid or in liquid form (slurry).

Solid manure disposal

Manure is treated as solid when the dry matter content exceeds 25 per cent, and which can be temporarily stockpiled. The height of the stack can be 1.5 to 2 metres. Stockpiled manure is kept on a concrete pad or plastic sheet at least 100 feet from wells and other water sources. Hard floors prevent moisture present in the manure to seep into the soil, and thus, avoids contamination of groundwater.

The manure is loaded in a trolley or cart and hauled away to the compost pits or vermicomposting unit. The dimensions of the compost pit may be 4 x 2 x 1 metres or 5 x 2.5 x 1 metres. The number of compost pits depends on the number of animals. In a vermicomposting unit, earthworms are used to convert the solid manure into vermicompost. The average manure output observed in different farm animals is given in Table 2.7.



Table 2.7: Daily manure output in farm animals

	Manure output (kg)	Dry matter content (%)
Cow	30–35	18–20
Buffalo	35–40	16–18
Sheep and Goat	1.0–2.5	38–40

Manure pit

It is constructed sufficiently away from the animal houses to avoid bad smell and infestation of flies and other insects. However, it need not be constructed very far which could require more labour for transporting manure. The manure pit is cleared every 6 to 8 weeks.

Liquid manure disposal

The mixture of dung and urine is known as slurry. A manure with less than 20 per cent solids has the consistency of thick slurry, which can be directly disposed into the fields.

Schedule of daily farm operations

Animals prefer to follow a certain routine, any deviation in which can cause stress in the animals. Certain operations like cleaning, feeding, milking, etc., are time-consuming and need to be finished in time, therefore proper scheduling of dairy farm operations is essential. The cleaning of animal shed and paddock requires major inputs of labour. Cleaning of cattle before milking is another important daily activity. Fig. 2.30 shows a cow with an unclean back and Fig. 2.31 shows a perfectly clean cow.



Fig. 2.30: Unclean cow



Fig. 2.31: A perfectly clean cow

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The dairy farmer follows a schedule of operations for efficient farm management. The schedule of daily farm operations at College of Veterinary Science and Animal Husbandry, NDVSU, Jabalpur is given in Table 2.8. The farmer can devise his/her own schedule of dairy farm operations on the basis of this schedule.

Table 2.8: Schedule of daily farm operations at College of Veterinary Science and Animal Husbandry, NDVSU, Jabalpur, Madhya Pradesh

Approximate time (hours)	Farm operations	Material required
04:00–04:30	Cleaning/brushing of milch animals	- Hose pipe - Water supply - Grooming brush
04:30–06:30	- At the time of milking, animals are offered half of the daily concentrate 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 cows 'in-heat' 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



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	• Feeding half of the daily concentrate mixture to calves, heifers, pregnant cows and bulls	• Concentrate mixture • Feed distribution trolley
	• 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	
14:00–17:00	• 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
15:30–17:30	• At the time of afternoon milking, animals are offered half of the daily concentrate required for milk production • Milking of animals	• Concentrate mixture • Measuring appliances • Towel • Milking bucket • Post milking teat dips

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

Notes

1. For all the above operations, one milkman is engaged for every 12–14 cattle. The general farm labourers begin their duty at 7:00 am and remain till 11:30 am. The milkers begin their duty at 3:30 am and go off duty by 7:30 am.



Fig. 2.32: An unclean paddock requiring cleanliness





Fig. 2.33: Dairy workers cleaning the paddock area with specially designed spade (phawda)

2. Animals are taken for grazing (if practiced) between 9 am and 2 pm in winter and between 6 am and 10 am and again between 5 pm and 7 pm in summer.
3. The manager plans the jobs well in advance in such a way that work is evenly distributed over the week. Some jobs may require longer time and the labourers are required to work extra time on such occasions.
4. The milkers come on duty by 2:30 pm and remain till 6:30 pm, whereas general farm labour start their duty by 2:00 pm and remain till 5:30 pm.

Practical Exercises

Activity 1: Note down the dimensions of various housing structures present in a nearby dairy farm.

Material required

Tape, Notebook

Procedure

1. Visit a dairy farm.
2. Measure the detailed dimensions of various sheds and allied structures present in the dairy farm and note them down in your notebook.

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Activity 2: Note down the daily schedule of a nearby dairy farm.

Material required

Notebook

Procedure

1. Visit a dairy farm early in the morning.
2. Note down each and every activity of the farm as per their time schedule.
3. Note down the routine and periodical activities of the farm.

Check Your Progress

A. Multiple choice questions

1. Which of the following animals prefers to wallow in water?
(a) Indigenous cattle (b) Crossbred cattle
(c) Buffalo (d) Exotic cattle
2. In a milch animals' shed, the width of the central passage is _____.
(a) 1.2 m (b) 1.8 m
(c) 2.2 m (d) 2.5m
3. Holding area is related to _____.
(a) calving box (b) calf pen
(c) milking parlour (d) bull pen
4. Advanced pregnant animals are transferred to a calving pen _____ before the expected date of calving.
(a) two to three weeks (b) one month
(c) one and a half month (d) two months
5. To maintain proper biosecurity, it is essential to maintain one isolation box per _____ cattle.
(a) 100 (b) 150
(c) 200 (d) 40

B. Fill in the blanks

1. Mixture of dung and urine is known as _____.
2. Animals defecate approximately _____ per cent of their body weight in a day.
3. To inhibit bacterial growth and to prevent spoilage of milk, the temperature of storage of milk is kept below _____ °C.
4. The number of calf pen in a farm is _____ per cent of the total breedable female cattle.
5. In the milch animal shed, the floor has the slope ratio of 1 in _____ towards the drainage.



C. Mark true or false

1. A good animal farm has many entry and exit points.
2. Milking parlour is a must in the loose housing system.
3. Damp and ill-drained floors do not cause respiratory problems in calves.
4. Bulls are kept in confinement, particularly on hard floors.
5. Calves in their initial days are housed in a group.

D. Match the following

- | A | B |
|--------------------|---|
| 1. Calving pen | (a) For keeping calf |
| 2. Calf pen | (b) Controlling of animals |
| 3. Trevis | (c) For keeping sick animals |
| 4. Isolation shed | (d) For the newly introduced animals in the farm |
| 5. Quarantine shed | (e) For keeping advance pregnant animal until calving |

E. Crossword

		¹ B			² P	
³	A		V			G
⁴ S			O			
	⁵ H		S			
		K				

Across

3. Act of parturition in cattle
4. A place where green fodder is stored under anaerobic conditions
5. Type of pipe used for washing of dairy animal shed.

Down

1. Castrated adult male of cattle
2. Confined area within a shed for keeping animals

GLOSSARY

Calving pen: An isolated and closed structure meant for giving birth by a cow or buffalo.

Chaff: The end product of chaffing, which is very palatable and used as cattle feed.

Chaffing: The process of cutting hay or straw or green fodder into very short pieces using a chaff cutter.

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Concentrate: Highly concentrated sources of nutrients to supplement the fodder and forages and include granular feeds such as cereals and legumes and some by-products of agro industries.

Down calver: A cow or heifer which is about to give birth to a calf.

Draught-free area: An area which is well-ventilated but does not allow strong and sudden drafts of air to enter.

Eaves: The part of a roof of animal housing/shed that overhangs the walls of a housing/shed.

Feedlot: An area where animals are offered feed and fodder in intensive type of dairy farming.

Hay: Dried and cut grasses used as fodder.

Heifer: Cows and buffaloes which have not yet given birth to a calf, or have given birth only once.

Herd: A group of cattle that live together.

Incinerator: The apparatus for burning the animal carcass at high temperatures until it is reduced to ash.

Manger: A structure used to provide feed to the animals.

Milking: The act of drawing milk from cows, goats or sheep for human consumption.

Milking machine: A special type of machine used to take milk from cows and buffaloes.

Milking parlour: An isolated building where cows and buffaloes kept in a loose system of housing are taken for milking.

Paddock: A fenced open area in a dairy farm used for pasturing or exercising animals.

Parturition: The birth of a new calf.

Pen: A small area with a fence round it in which livestock are kept.

Oestrus: It is the period when the female cows or buffaloes accept their male counterparts and mate. Such females are also called as being in heat.

Silo: A large structure, typically cylindrical, in which fodder or forage is stored for future use.

Slope ratio: The slope of a surface is generally calculated as a ratio, for example, a slope ratio of 1 to 100 cm means that the height of the surface decreases at the outermost end to 1 cm from the central height of 100 cm.

Stanchion: An iron chain loosely fitted around the neck of an animal to control its forward and backward movement within the shed.

Vermicompost: The final product of breakdown of manure and other bio-degradable matter by earthworms.

Water trough: A long, narrow, usually box-like shape, used to hold water for livestock.



Unit

3



Establishing Livestock within Accommodation

INTRODUCTION

Management of dairy animals involves various activities like feeding, milking, cleaning, etc., as per the set routine. It is obvious that some animals would suffer from illness or injury at some or the other point, which could be identified from abnormal behaviour or specific symptoms shown by them. This Unit discusses the various aspects of management of livestock within their accommodation.

As a dairy entrepreneur, one has to regularly inspect the animals to check for abnormalities and identify the problem at the earliest. Sometimes, new animals are brought to the farm from different places. It is important to ensure that the animals do not feel stress during transportation. At the same time, efficient management also includes protecting the farm workers involved in the day-to-day operations, from injuries or risks. Also, large quantity of manure is produced in a dairy farm on a daily basis, which requires proper disposal, otherwise it could lead to infections as well as environmental pollution.

SESSION 1: STANDARD PRACTICES FOR MAINTAINING HEALTH OF CATTLE

The farm supervisor is required to inspect and observe the animals carefully for any illness or injury, every day. The daily routine of feeding, milking and caring is followed, and any major change in the routine could affect the health and production of animals. This could lead to abnormal behaviour or specific symptoms of illnesses in animals, some of which are mentioned in Fig. 3.1.

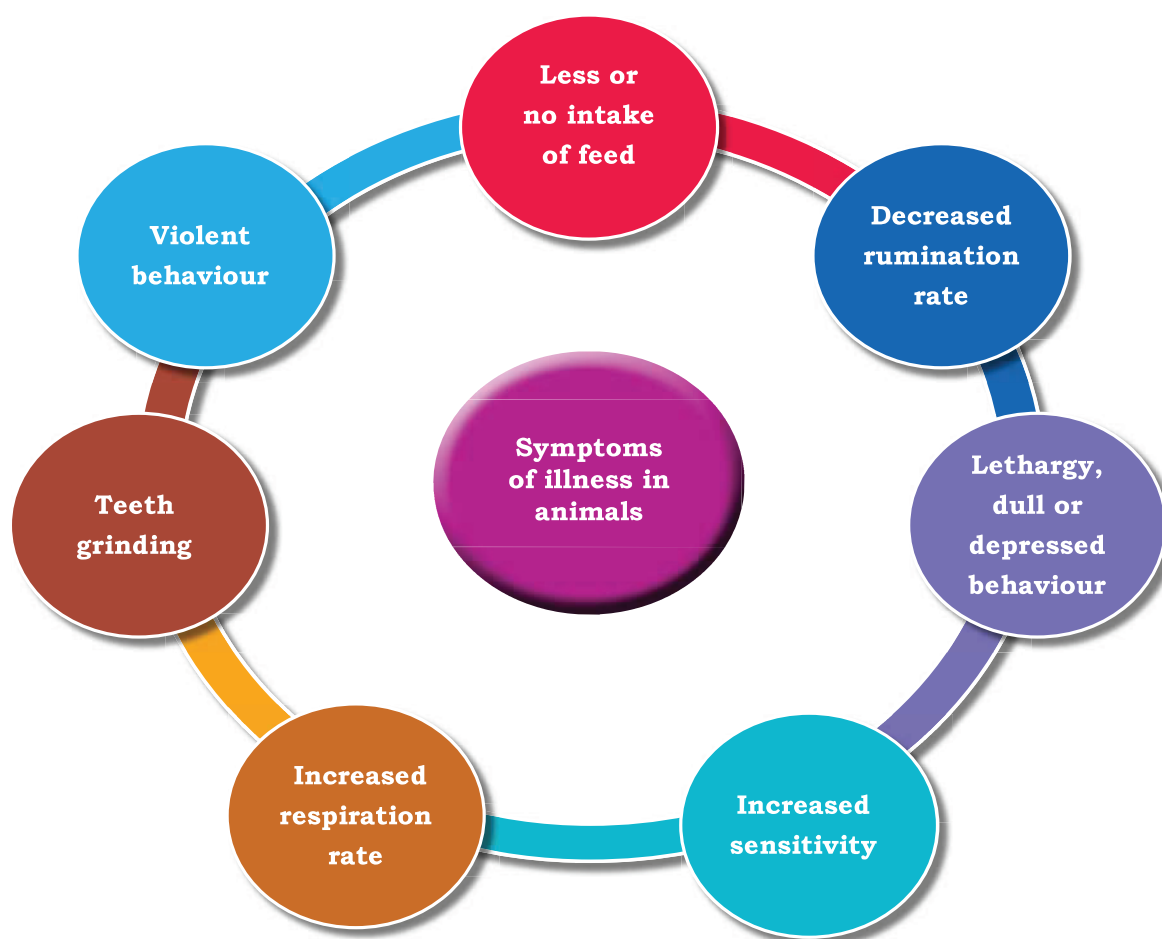


Fig. 3.1: Symptoms of illness in animals

Some measures that could be undertaken to supervise and maintain the health of the dairy animals are presented in Fig. 3.2.



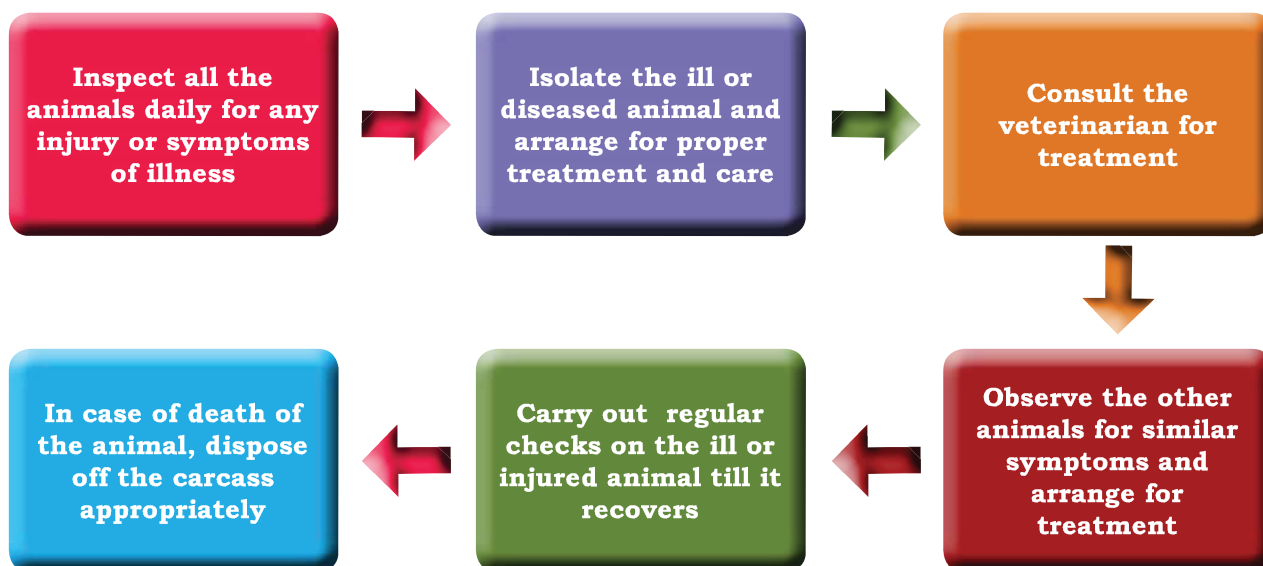


Fig. 3.2: Measures for effective supervision of health of cattle

Vaccination

Dairy animals, just like human beings, are susceptible to various fatal diseases caused by bacteria, viruses, fungi, parasites, etc. Diseased animals can cause substantial economic losses to a dairy farm, which is why it is necessary to prevent them from diseases as much as possible.

Vaccination means the administration of a particular vaccine into the animal's body for producing immunity in the body of the animal against a specific disease. It is an efficient and powerful method to promote the health of animals by preventing outbreak of major diseases, which have an impact on animal health and production as well as human health. The major diseases in cattle requiring vaccination are given in Fig. 3.3.

A vaccine is a fluid containing attenuated or killed micro-organisms that makes an animal immune to a disease caused by certain germs or micro-organisms. The vaccine contains some part of the germ or the poison that the germ produces. The vaccine does not make the animal sick, in fact it protects the animal's body from getting diseased in future. The vaccine is administered generally subcutaneously or intramuscularly, based on the standard instructions prescribed for that vaccine. It must always be remembered that vaccines are administered only to healthy animals.

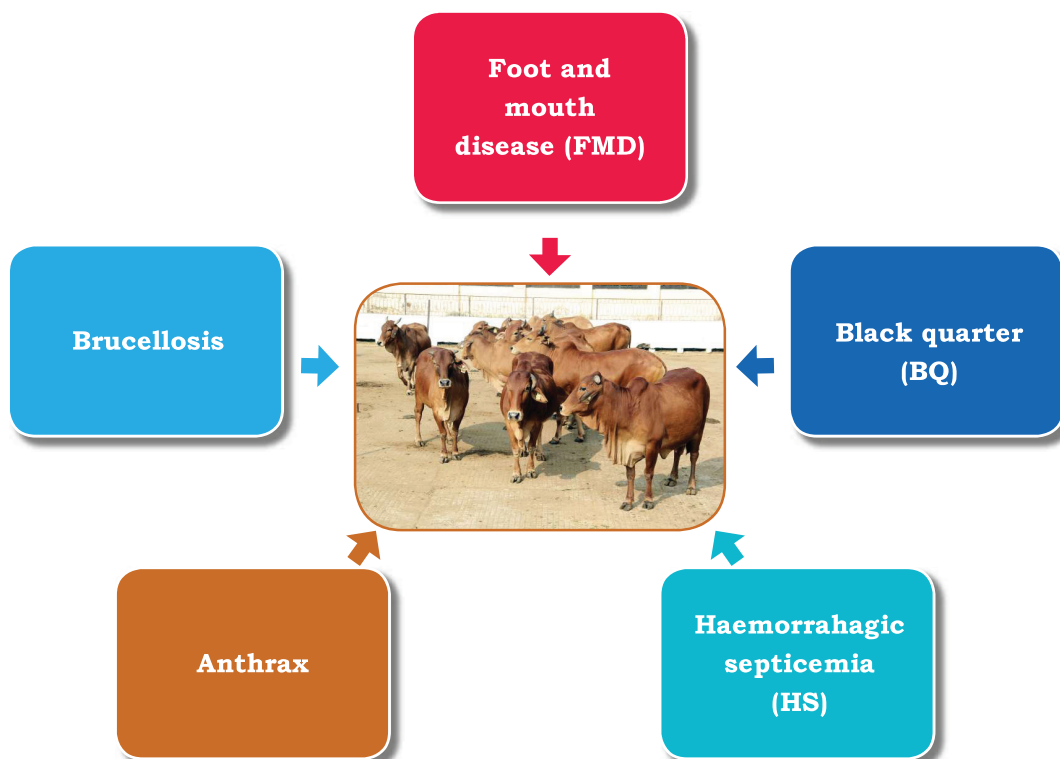


Fig. 3.3: Major diseases in cattle requiring vaccination

Vaccination schedule for cattle

The recommended vaccination schedule for some diseases in cattle are given in Table 3.1.

Table 3.1: Vaccination schedule for some diseases in cattle

Vaccine	Age of primary vaccination	Booster	Revaccination
FMD vaccine	4–6 months	9 months after primary vaccination	Annually
HS vaccine	6 months	–	Annually
BQ vaccine	6 months	–	Annually
Anthrax vaccine	6 months	–	Annually in endemic areas
Brucella vaccine	4–8 months in female calf only	–	–

Source: *Farmers Manual, Department of Animal Husbandry, Dairying & Fisheries, Government of India, Ministry of Agriculture and Farmers Welfare*



Most of the vaccines used in farm animals are developed from live infectious organisms. Vaccines are very sensitive to temperature variations, which is why they must be handled and administered properly.

Documentation of vaccination

Proper documentation of vaccination is quite important as it becomes a legal proof of vaccination in animals in the event of outbreak of a disease and therefore, helps the farmers claim compensation from insurance companies. Documentation is also required for monitoring adverse reactions in the animals in which vaccination has been carried out.

The following information is recorded in the vaccination record of each animal.

- (i) Name of the vaccine administered, manufacturer's detail, lot or serial number, date of expiry
- (ii) Date of administration of vaccine
- (iii) Route of administration of vaccine

The manufacturer's label can be removed (Fig. 3.4) from the vaccine bottle and pasted on the register or record book. It is easier to maintain such records on a computer.

There are some other aspects of vaccination like pre- and post-vaccination care, handling and administration of vaccines and disposal of unused vaccines, for which you can refer to Session 2 of Unit 2 of *Animal Health Worker* (Class IX).

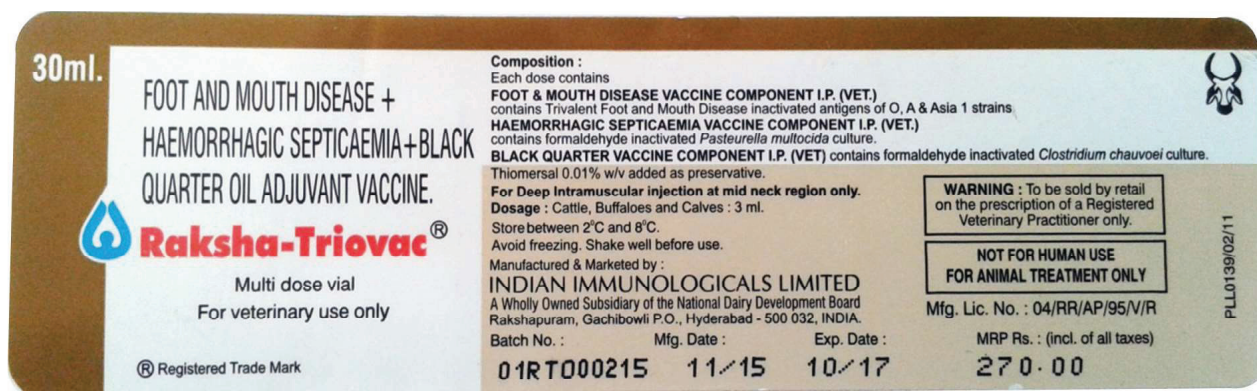


Fig. 3.4: A specimen of vaccine label showing (1) name of vaccine, (2) route of vaccination, (3) vaccination dosage, (4) optimum temperature for storage of vaccine, (5) batch number, (6) manufacturer's details, etc.

Establishing suitable environmental conditions in a dairy farm

Farm animals are homoeothermic which means there are little changes in their body temperature. However, metabolic heat is produced in them and subsequently released to the atmosphere by means of convection, conduction and radiation. When the heat and moisture produced by the animals within an animal house gets accumulated, it causes stress to the animals and ultimately leads to distress and diseases. Thus, intensive livestock housing is equipped with an environmental control system to maintain animal health and welfare. Modifications in environment are achieved by ventilation, heaters for extreme cold conditions and cooling equipment for hot climatic conditions. The following environmental conditions are maintained for optimum milk production.

Temperature

The favourable temperature within the animal shed is between 15°C to 27°C. Deviation in the temperature may cause significant loss in productivity and health of the cattle.

Relative Humidity

Optimum relative humidity of dairy animal house is about 40 per cent to 60 per cent. Significant variation in the relative humidity can cause stress in animals.

Ventilation

The animals feel comfortable when they are kept in a well-ventilated animal house. When the animal shed is properly ventilated, obnoxious gases produced within the animal house come out easily. It is important to ensure that animal sheds are not overcrowded.

Wind Velocity

Animals feel comfortable when wind speed is about 5–8 km/hr. Planting of green belt (with trees) in areas with high wind velocity breaks the wind speed and minimises the disturbance in the environment.



Optimum and natural light

Artificial or bright lights can disturb the routine of animals and affect their health and productivity, and therefore, arrangements for optimum and natural light are necessary. Extra care is provided to weak, ill or injured, pregnant and young animals.

Minimising stress in dairy animals

The common factors responsible for creating stress in dairy animals are given in Fig. 3.5.

Cattle are social animals that prefer to stay in a herd (Fig. 3.6). They do not like to be isolated, and move quickly and become aggressive if mishandled and provoked. Cattle in stress could be dangerous to livestock handlers, and in case of rough handling, the animals could become averse to people.



Fig. 3.5: Causes of stress in dairy cattle

NOTES



Fig. 3.6: Cattle exhibiting herd behaviour

Transportation of dairy animals

Transportation of livestock involves a number of operations like handling, loading and unloading. Important parameters to consider while transporting animals are environments unfamiliar to animals, isolation, social disruption, confinement, fluctuations in environmental temperature, humidity, feed and water deprivation, etc.

The main objective of transportation is to ensure the safety, security and comfort of the animals, while moving them efficiently to their destination. Transportation can result in significant stress for the animals, which can be categorised as — physical (changes in temperature, humidity or noise), physiological (limited access to feed and water) and psychological (exposure to new individuals or environments).

Purpose of transportation

Animals are transported for various reasons such as change of ownership, marketing, movement from drought areas to better grazing areas, treatment, exhibitions (*krishi mela*) and animal fairs.

Modes of transportation

The usual modes of transportation for animals are:

- On foot (walking/trekking)
- Road
- Rail
- Sea
- Air



Loading and unloading ramps (elevators) for livestock

Ramp is a sloping surface used to allow access from a lower level to a higher level. It is used to load and unload the animals in a vehicle or train. Loading and unloading ramps provide non-slippery footing to prevent animals from falling. On concrete ramps, stairs provide good footing. The recommended angle of the loading ramp is 20° or less.

Transport of livestock on foot

Cattle can be successfully moved on foot. The journey of animals is planned by paying attention to the total distance to be travelled, opportunities for grazing and watering and overnight rest. Animals walk during the cooler period of the day. If they are to be loaded in a rail wagon after moving some distance, they are given sufficient time for rest and water before loading. The maximum distance that animals can walk on foot depends on the weather, body condition, age, etc. The maximum distance that can be covered for transporting different animals on foot, are given in Table 3.2.

Table 3.2: Maximum distances for trekking

Species	One day journey	More than one day	
		First day	Subsequent days
Cattle	30 km	24 km	22 km
Sheep/goats	24 km	24 km	16 km

The specifications for transportation of animals on foot are presented in Table 3.3. No animal is made to walk under conditions of heavy rain, thunderstorm and extremely dry conditions. Also, they are not transported on foot before sunrise or after sunset. While transportation on foot is beneficial and economical for short distances, some disadvantages of this method are longer travel time, exposure to extreme environmental conditions and loss of body weight of animals.

Table 3.3: Specifications for transportation of animals on foot

Species	Maximum distance travel (km/day)	Speed (km/hr)	Maximum hours travelling in a day	Period of rest, drinking and feeding	Temperature range (°C)	
					Max.	Min.
Cows and buffaloes	30	3–4	8	At every 2 hours for drinking and at every 4 hrs for feeding	12	30
Calves	16	2.5	6	At every 1½ hours for drinking and at every 3 hrs for feeding	15	25

Transport of livestock by road

When it is not feasible for transporting animals on foot, they are transported by road with the help of trucks. The body of the truck is cleaned with a broom to maintain cleanliness and suitable bedding material is provided on the floor of the truck to make the journey comfortable to the animals. Sand (10–12 cm depth) or straw bedding (15 cm depth) are good bedding material. The trucks are also connected to the loading ramp. Partitions are made with bamboo in the truck for individual animals. An attendant is present all the time during the journey.

It is important to note that the vehicles transporting animals are not loaded with any other merchandise. To prevent cows and buffaloes from being frightened or injured, they must face the engine side. The animals can be placed either head-to-head or tail-to-tail on the truck. Feed and water must be supplied at an interval of 8 to 10 hours. The attendant accompanying the animals looks after them during the journey. The animals must be given rest and a little exercise on the ground at an interval of 10–12 hours. They are then again loaded in the truck for the remaining journey.

The number of cattle per truck for safe loading is given in Table 3.4.



Table 3.4: Space requirement for cattle during transportation

Vehicle size (length × width) (square metre)	Floor area of the vehicle (square metre)	Number of cattle			
		Cattle weighing upto 200 kg (@1 square metre space per cattle)	Cattle weighing 200–300 kg (@1.20 square metre space per cattle)	Cattle weighing 300–400 kg (@1.40 square metre space per cattle)	Cattle weighing 400 kg (@2.0 square metre space per cattle)
6.9 × 2.4	16.56	16	14	12	8
5.6 × 2.3	12.88	12	10	8	6
4.16 × 1.9	7.904	8	6	6	4
2.9 × 1.89	5.481	5	4	4	2

Source: *Transport of the Animals Amendment Rules, 2008 under Section 38 of the Prevention of Cruelty to Animals Act, 1960, Ministry of Environment and Forests, Government of India*

Road transport is quite suitable when long distances are to be covered, and it also provides freedom to choose the time of movement of the animals. Also, it allows direct transportation of the animals from the source to the destination. However, there are a few disadvantages of this method like higher chances of injury and body weight loss in animals due to extreme stress.

Transport of livestock by rail

Transportation of animals by rail is done when very long distances are to be covered. The size of the wagon and the size of the cattle determine the number which can be loaded on a single wagon. For comfort in transportation, the wagon is loaded heavily enough so that animals stand fairly close to each other; however overcrowding is avoided. An ordinary railway goods wagon carries ten adult cattle. The following points are kept into consideration while transporting cattle by train.

- At least one attendant is present in each wagon.
- Cattle are loaded parallel to the rails, facing each other.
- Cattle wagon is always positioned in the middle of the train.

NOTES

- Two breast bars are provided on each side of the wagon, one at a height of 60–80 cm and the other at 100–110 cm.
- Cattle in milk are milked at least twice a day and the calves are given the required quantity of milk.
- It is always preferable to move cattle during the night.

The advantages of railway transport are less stress to the animals as compared to road transport, ease in covering long distances in a short span of time and reduced chances of bruising and other injuries during handling. Some disadvantages of this method are adhering to the railway timetable and difficulty in transporting lesser number of animals.

Transport of livestock by sea

Animals have been transported by sea, lakes and rivers since time immemorial. Sea route is preferred when animals have to cover a long journey. The animals considered to be of high value and used for breeding purposes are transported by sea route. About 40 square feet area is required for each cattle. Crates of dimensions 5 feet long, 3 feet wide and 3 feet high are sometimes used for transporting animals. The examination of animals is done at an interval of 2 to 3 hours.

Transport of livestock by air

Usually highly valued animals are transported by air, like race horses, poultry parent stock, etc. However, in certain circumstances other livestock could also be transported through air.

Animals not suitable for transport

The conditions in which animals are not suitable for transport as follows.

1. Weak newborns, emaciated animals and animals with injuries.
2. Animals nearing the time of parturition.
3. Animals in advanced pregnancy.
4. When the pregnant cattle has approached the maximum pregnancy period allowed for transportation, as given in Table 3.5. In general,



- it is not advisable to transport cattle during the last trimester of pregnancy.
5. Animals that have given birth during the preceding 48 hours.
 6. Aged animals.
 7. Unfavourable climatic conditions like very hot or cold weather or heavy rains.

Table 3.5: Maximum pregnancy period in farm animals beyond which transportation is forbidden

Animals	Maximum period of pregnancy
Cow	190–200 days
Buffalo	210–220 days

Practical Exercises

Activity 1: Identify sick animals and note down the symptoms of diseases in them.

Material required

Thermometre, Mask, Apron

Procedure

1. Visit a dairy farm.
2. Identify the sick animals.
3. Note down the symptoms of the diseases.
4. Examine the body temperature of the sick animals.

Activity 2: Examine the vaccination procedure of dairy animals at a dairy farm.

Material required

Notebook, Farm records

Procedure

1. Visit a dairy farm.
2. Find out the vaccination records.
3. Note down the vaccination schedule followed at the farm.

Check Your Progress

A. Multiple choice questions

1. During transportation of animals by foot, the maximum distance travelled in a single day journey for cattle is _____.
 (a) 10 km (b) 20 km
 (c) 30 km (d) None of these
2. Animals need to be transported for _____.
 (a) Change of ownership (b) Treatment
 (c) Breeding (d) All of these

NOTES

3. Primary symptoms of illness in cattle are _____.
 - (a) lethargy, dull or depressed
 - (b) teeth grinding
 - (c) decreased rumination rate
 - (d) All of the above
4. Preferable relative humidity in the animal house is _____.
 - (a) less than 20%
 - (b) 20–40%
 - (c) 40–60%
 - (d) Above 60%

B. Fill in the blanks

1. _____ is the sloping surface used to allow access from one level to a higher level.
2. For very short distance transport, the easiest and most economical method of transport is _____.
3. The recommended angle of the loading ramp is _____.
4. Cattle are _____ animals used to living in herds.
5. The frequency of vaccination against Black quarter is _____.

C. Mark true or false

1. Transportation of aged animals is avoided.
2. During transportation of cattle by rail, the cattle wagon is attached at the end of the train.
3. Animals that are nearing the time of parturition are not transported.
4. Vaccination is done to prevent the animals from diseases.
5. Rough handling of cattle makes them frightened of people.

D. Match the following

- | A | B |
|---|----------------|
| 1. Angle of the loading ramp | (a) 40% to 60% |
| 2. Optimum relative humidity of dairy animal house | (b) 20° |
| 3. The favourable temperature within the animal shed is between | (c) 25°C |

E. Crossword

		¹	⁴ R			K
	²	O		D		
			P			
³ R			L			



Across

1. Vehicle used for road transport
2. Usual mode of transportation of animals
3. One of the modes of transportation by which comparatively large number of animals can be transported at a time

Down

4. Structure required for loading and unloading of animals.

SESSION 2: SAFETY MEASURES FOR FARM WORKERS AND DISPOSAL OF MANURE

In well-managed dairy farms, dairy workers are protected from injury or impairment of any bodily function that might occur due to absorption or inhalation of harmful elements, or even by physical contact with diseased animals. In this session, we will discuss the personal protective equipment and measures for safety of farm workers and the preferable methods for disposal of manure.

Personal protective equipment (PPE) for dairy workers

The dairy workers wear protective clothing and adequate protective equipment while carrying out day-to-day operations.

Risks during animal handling, feeding or milking or other routine operations can be minimised by using personal protective equipment (PPE) by the farm workers.

Common PPE used by the dairy workers

The most often used PPE include the following.

Gloves

It helps to protect the hands from contact with hazardous substances, hot or cold surfaces, stings, rough textures or sharp tools (Fig. 3.7).

Safety shoes or gumboots

These are used in dairy farms for various routine farm activities (Fig. 3.8). Gumboots protect the toes and legs



Fig. 3.7: Gloves



Fig. 3.8: Gumboots

of the farm workers from injuries by being stampeded by animals. Gumboots also provide protection from snake bites, slippery surfaces, sharp item penetration, water penetration, etc.

Goggles

They protect the eyes from dust and straw particles and fumes. They are used during weeding, welding, cutting and while working in the workshop.

Earplugs and earmuffs

They protect the farm workers from high noise levels emitted from machines, such as chainsaws, or animals, such as pigs, when housed.

Face protection

It is used while welding, to protect the eyes, nose and mouth from fumes, heat and stray metal. Face protection must also be worn while mixing, spraying or applying chemicals or using solvents, and also while grinding metal or cutting timber.

Hard hats

These help prevent injuries from falling objects.

Breathing apparatus

This is particularly needed when working in confined spaces such as in silos.

Both the dairy owner and the workers must wear all necessary and prescribed protective clothing and equipment while operating machines as per manufacturer specifications. Loose clothing must be avoided while operating machines, tractor, etc., to prevent the clothes of the farm workers getting caught into moving parts.

Safety measures during farm activities

- (i) Always read instructions on labels of chemicals, pesticides, fumigants or disinfectants before use.
- (ii) Use chemicals as prescribed by the manufacturer.
- (iii) Use protective clothing as specified by the manufacturer while handling chemicals.



- (iv) Dispose off chemical containers and medical waste appropriately to minimise environmental damage.
- (v) Take immediate medical help or assistance in case of accidents due to chemicals.
- (vi) Keep necessary emergency equipment and first aid accessible as per manufacturer's specifications while handling chemicals.
- (vii) Chemicals are always kept away from children and animals.

The risks associated with the dairy workers and farmers are as follows.

- (i) Transmission of diseases
- (ii) Problems related to the handling of animals
- (iii) Problems of the working environment

The common problems encountered in the farm and their remedial measures are given in Table 3.6.

Table 3.6: Common problems and their remedial measures

Common problems	Remedial measures
Damage to clothing	Wear comfortable overalls without lengthy projections. Always use waterproof footwear.
Burns and scalds	Wear covering for hair. Always wear gloves while handling hot items, insecticides, chemicals, etc.
Dust inhalations	Wear face masks to filter out dust
Cuts on fingers and wrists	Wear gloves

Collection of manure and washing

Manure is the breeding place for pathogens and insects. Solid manure is usually collected and removed from the animal shed twice daily and the floor of the animal house is flushed. Semi-solid and liquid manure (slurry) is removed with the help of a water hose pipe.

Solid waste from livestock farm is dumped in the manure pit. These wastes are gradually changed into manure by the bacterial activity after few months. The manure pit is about 100 metres away from the animal shed and other structures. It helps in avoiding foul smell originating from the manure pit and safeguards against

NOTES

flies and insects. Manure pits are easily accessible from different parts of the farm. They are placed far from the water source. A roof may be provided over the pit to protect it from rain.

The liquid manure can also be flushed through a shallow drain located longitudinally to the longer axis of the animal house. Each shallow drain of the shed is connected to the sub-drain and subsequently to the main drain. The main drain is finally connected to the liquid manure storage tank, or the same can be treated by effluent treatment plant. The treated water is reused for agricultural crops.

Effective disposal and utilisation of manure

There are various methods for handling and treating animal waste (Fig. 3.9). Methods that are available for applying animal excreta into the soil include:

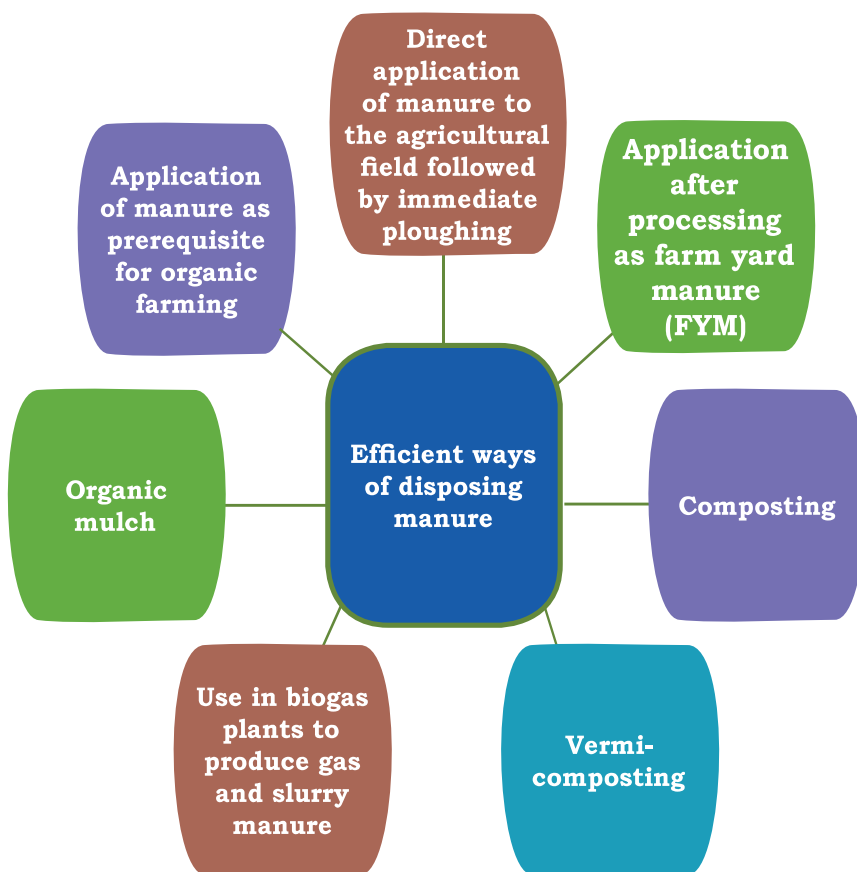


Fig. 3.9: Various methods of disposal of manure



1. Farm yard manure (FYM)
2. Conversion into compost
3. Vermicomposting
4. As a feedstock in biogas plants to produce gas and slurry manure.
5. Organic mulch: It is a layer of organic material which protects the soil from erosion by reducing direct impact of rains thereby slowing overland flows.

Farm Yard Manure (FYM)

When a mixture of dung and urine of farm animals and leftover feed and fodder is allowed to decompose slowly, the resulting product is called FYM. The composition of FYM depends on the type of animals, their ration, age, species, etc.

Composting

Composting is the process whereby organic matter is decomposed by micro-organisms. This process is in practice for centuries by farmers who stock dung into piles or in pits (Fig. 3.10). Composting can be either aerobic or anaerobic. The advantages of aerobic decomposing are shorter stabilisation time, no foul smell and destruction of weed seeds and pathogens. During composting, temperatures can reach as high as 150°F, whereas most of the pathogens harmful to humans are destroyed at 131°F.



Fig. 3.10: Compost pit

Composts must be handled carefully. An unripe compost has a high temperature which can damage the plants in which it is put. Mature manure compost is safe to use and is the best type of organic fertiliser. Older composts can be identified by their colour and moisture, a black and dry compost is considered as mature and a yellowish and wet compost is not suitable for use in plants.

Vermicomposting

The term vermicomposting means the use of earthworms for composting organic residues. By the process of vermicomposting, the earthworms convert the organic material into humus-like material, and process the farm waste quickly and efficiently.

Earthworms (Fig. 3.11) consume all kinds of organic matter and eat equivalent to their own body weight per day; for example, 1 kg of worms can consume 1 kg of organic matter daily. The end-product, i.e., the vermicompost is the excreta of earthworms rich in humus and nutrients (Fig. 3.12). The excreta (castings) are rich in various soil nutrients like nitrogen, potassium, phosphorus, calcium and magnesium. The earthworm castings contain 5 times the nitrogen, 7 times the potassium and 1½ times the calcium as found in good top soil. *Eisenia foetida* and *Lumbricus rubellus* (red worm) species of earthworms are commonly used for vermicomposting. Besides converting the organic waste into valuable manure, earthworms keep the environment healthy.



Fig. 3.11: Earthworms used in vermicompost preparation

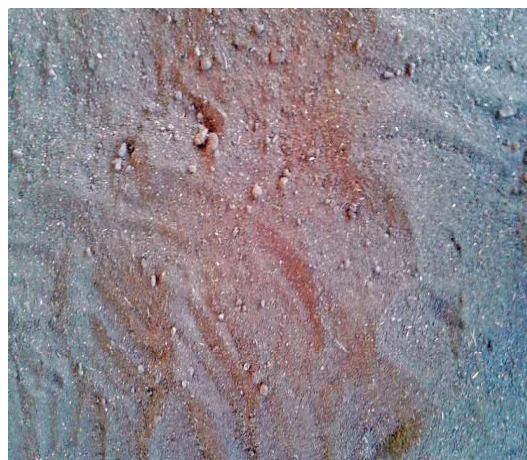


Fig. 3.12: Vermicompost



Benefits of vermicomposting

The benefits of vermicomposting are given in Fig. 3.13.

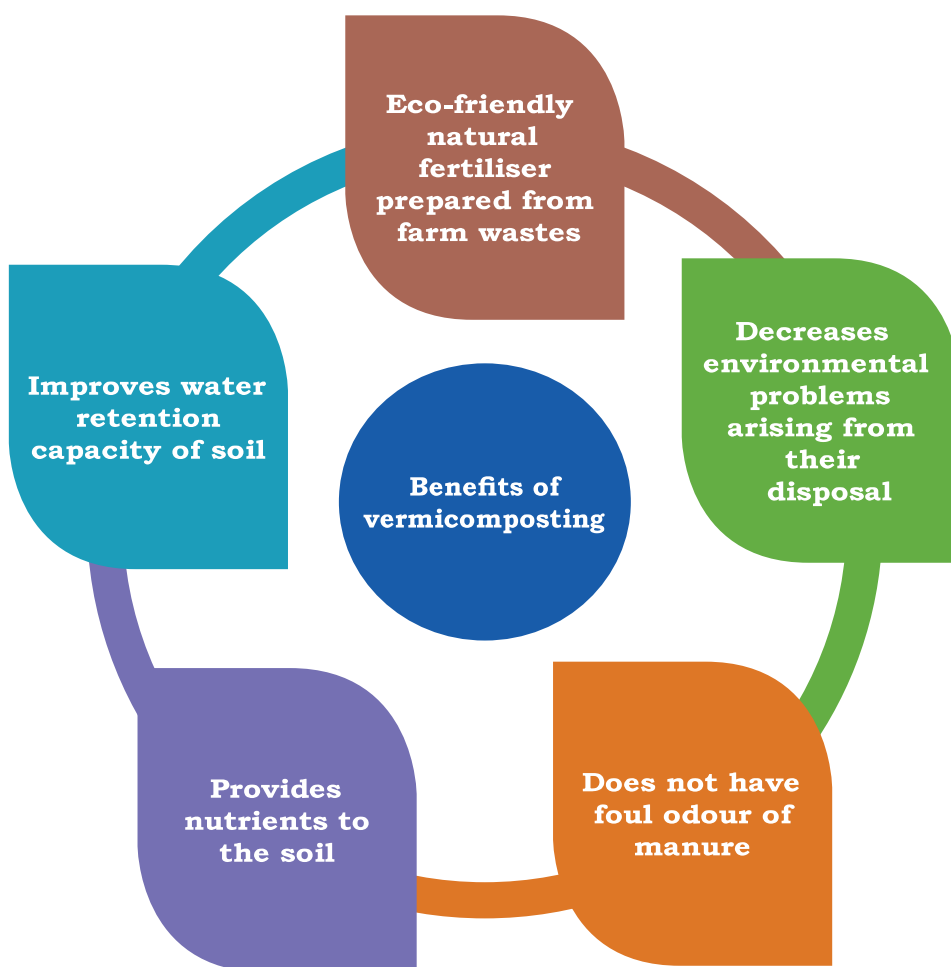


Fig. 3.13: Benefits of vermicomposting

As a feedstock in biogas plants to produce gas and slurry manure

Biogas is non-poisonous, with a characteristic odour, which disappears on burning. When mixed with air, it burns with a non-luminous blue flame without producing any smoke. It has a very low level of inflammability. Biogas is used for household cooking, lighting and power. Special lamps are available for lighting where biogas can be used. Combustion engines, commonly available, can be run on biogas. To do this, a special attachment is fitted to the combustion engine. Such

NOTES

attachments are readily available. The biogas-spent slurry is better than Farm Yard Manure (FYM) since it is well digested and has high nutrient contents.

Organic mulch

Mulch is a layer of material applied to the soil surface. It reduces water loss by reducing evaporation from the soil. Mulch also keeps the soil cooler, reduces weed growth, run-off and erosion. Manure can be used as mulch but are best mixed with other mulches, especially if the manure is fresh.

Practical Exercise

Activity 1: Prepare vermicompost in your school.

Material required

Manure, Earthworm, Waste fodder, Leaves, Water, Covered area

Procedure

1. Bear in mind that the vermicomposting unit must be in a shady area.
2. Prepare a layer of chopped dried leaves/fodder of about 15–20 cm as bedding material.
3. Mix cow dung and waste fodder in the proportion of 3:1 and keep it for 7–10 days.
4. After partial decomposition of material, make a bed of size 6 x 2 x 2 ft.
5. Release about 1500 to 2000 earthworms on the upper layer of the vermicompost bed.
6. Sprinkle water immediately after releasing the worms.
7. Maintain sufficient moisture in the beds by sprinkling water daily and covering with gunny bags.
8. Turn the bed once after 30 days to maintain proper aeration within the bed.
9. Check if the compost gets ready in 45–50 days.

Check Your Progress

A. Multiple choice questions

1. The dairy farm worker wears protective equipment to protect _____.
(a) eyes (b) face
(c) head (d) All of these
2. Composting can be done _____.
(a) aerobically (b) anaerobically
(c) Both (a) and (b) (d) None of these



3. For which purpose is biogas used?
 - (a) Household cooking
 - (b) Lighting
 - (c) Power
 - (d) All of these
4. Which of the following conditions is associated with the risk of a dairy farm worker?
 - (a) Problems of transmission of diseases
 - (b) Problems related to the handling of the animals
 - (c) Problems of the working environment
 - (d) All of the above
5. Which of the following is an advantage of mulching?
 - (a) acts as a soil cooler
 - (b) reduces weed growth
 - (c) reduces erosion
 - (d) All of these

B. Fill in the blanks

1. PPE stands for _____.
2. The manure pit is generally dug out on a dry and fairly elevated land about _____ metres away from the animal houses.
3. Manure is removed from the animal shed _____ times daily.
4. Vermicompost is the excreta of _____ rich in humus and nutrients.
5. Biogas burns with a non-luminous _____ coloured flame without producing any smoke.

C. Mark true or false

1. Liquid waste from livestock farm is dumped in the manure pit.
2. PPE only protects the individual and does not prevent the accident from happening.
3. Slurry is obtained from FYM.
4. Black colour and dryness is the indication of immature compost.
5. Mulch is a layer of material applied to the soil surface.

D. Match the following

- | A | B |
|---|---------------------|
| 1. Natural process in which organic matter is decomposed by micro-organisms | (a) Manure pit |
| 2. Use of earthworms for composting organic residues | (b) Mulch |
| 3. Solid waste from livestock farm is dumped | (c) Slurry |
| 4. A layer of material applied to the soil surface | (d) Composting |
| 5. Manure in liquid form | (e) Vermicomposting |

NOTES

GLOSSARY

Earthworm castings: *It is also known as vermicast which is nothing but worm's manure in its natural form. It contains an abundance of bacteria, remnants of decaying plant matter, enzymes, earthworm cocoons and other by-products.*

Homoeothermic: *The ability of cattle to maintain a constant and persistent body temperature which is almost independent of the surrounding environmental temperature.*

Rumination: *The activity of cattle to bring back the consumed feed to the mouth and chewing it for a second time.*

Transportation: *The act or process of moving animals or things from one place to another.*

Waste: *Unwanted or unusable items generated from a unit.*



Unit

4



Providing Feed and Water for Livestock

INTRODUCTION

Feed costs constitute about 70 per cent of the total cost incurred on dairy animal production. A good animal feed is balanced properly with proteins, carbohydrates, fats, minerals and vitamins, and plays a pivotal role in successful dairy farming. A good quality feed is palatable, economical and has such composition that animals feed liberally. It is moderately bulky, laxative and free from toxins (Fig. 4.1).

The selection of percentage of ingredients to be incorporated in the ration is based on their prices in particular seasons to reduce the cost of feeding. The feed ingredients are purchased when they are available at cheaper rate and stored for future use. Storage losses are minimised to provide feed at cheaper rate.

SESSION 1: ANIMAL FEEDSTUFF, THEIR CHARACTERISTICS, COMPOSITION AND QUALITY

Types and characteristics of animal feedstuff

Animal feedstuff are broadly classified into three categories depending upon percentage of crude fibre (CF), total digestible nutrients (TDN) and crude protein (CP). Depending upon the availability of different items,

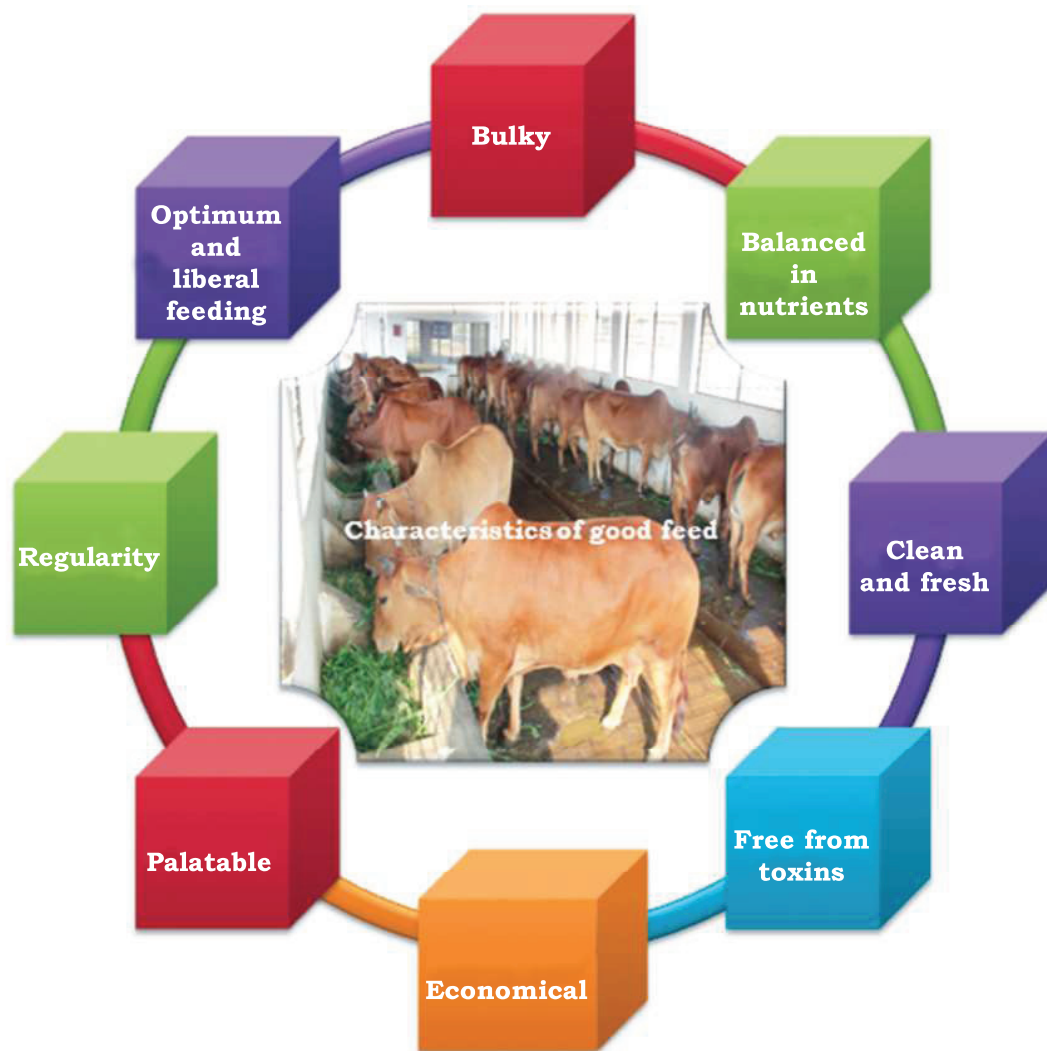


Fig. 4.1: Characteristics of good feedstuff for animal

a dairy farmer can add or delete the nutrient items in various ways to fulfil the dietary needs of the livestock. Fig. 4.2 explains the broad concept of partitioning of feedstuff into CF, TDN and CP.

Feed composition and its quality

The animal feed can be approximately partitioned in six major components, i.e., water, ash, crude protein (CP), ether extract (EE), crude fibre (CF) and nitrogen-free extract (NFE) (Fig. 4.3). An exact measurement of these six components in the feed is required to know the quality of the feed, e.g., if the given feed is fibrous, energy-rich or protein feed.



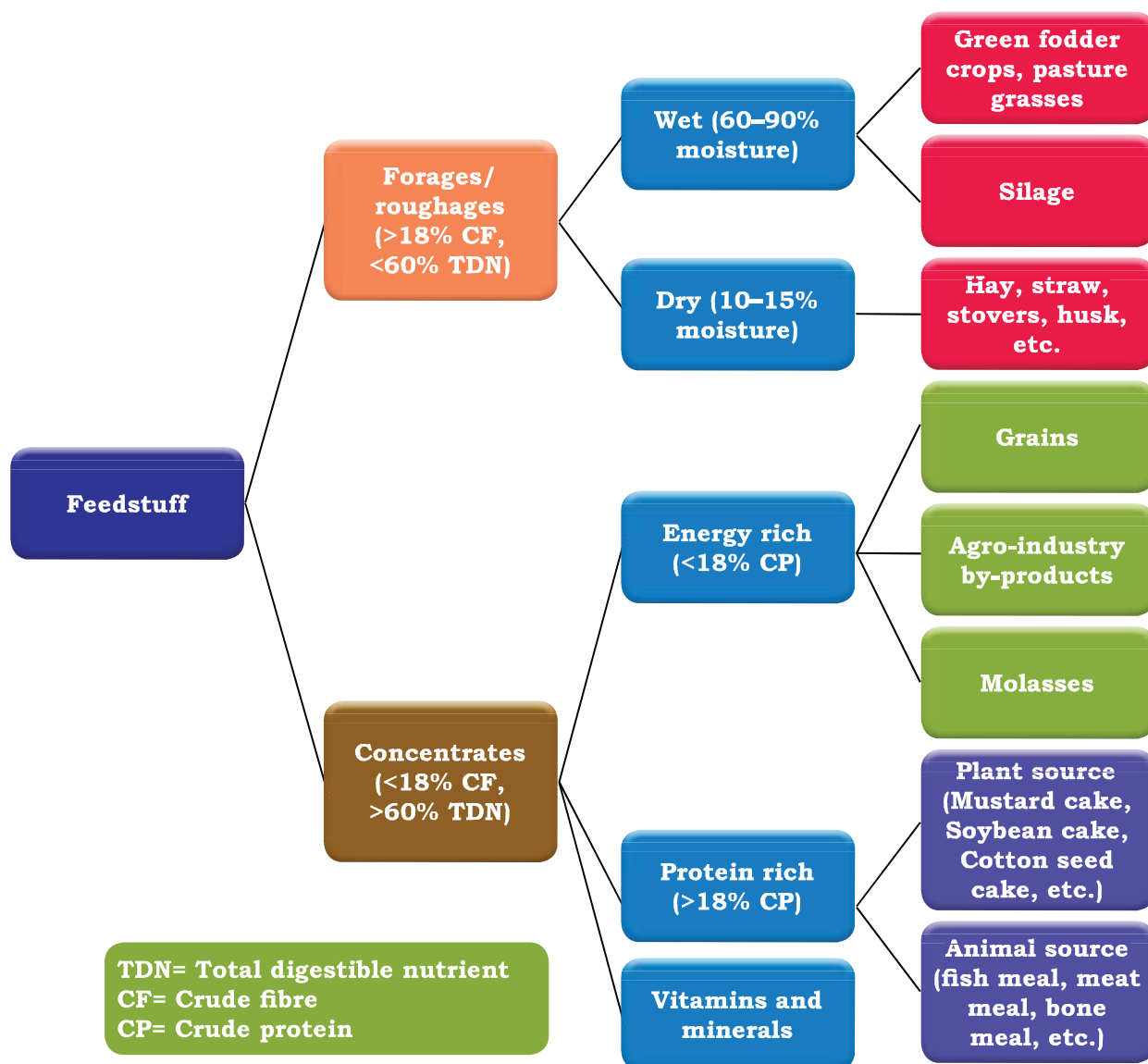


Fig. 4.2: Types of animal feedstuff

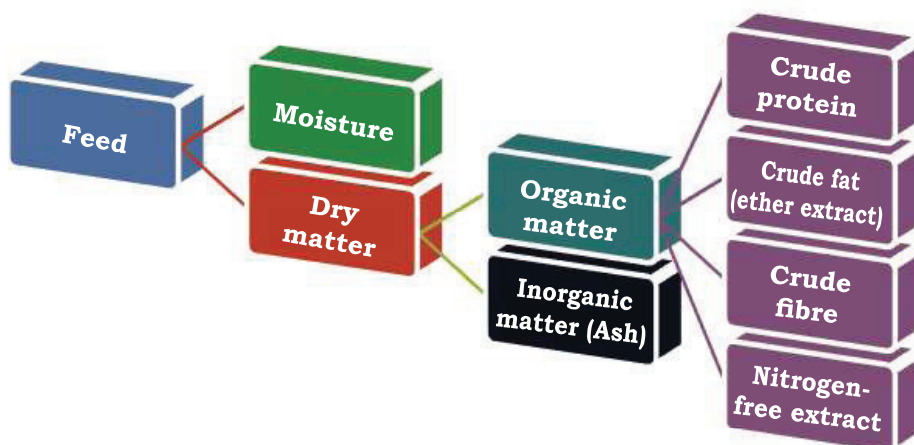


Fig. 4.3: Feed composition

The animal feed consists of six major constituents. The details of the various components found in the feed are given in Table 4.1.

Table 4.1: Components in the six constituents of animal feed

Animal feed constituents			Components
Moisture			Water, 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, fat soluble dyes
		Crude fibre	Cellulose, hemicelluloses, lignin
		Nitrogen-free extract	Soluble carbohydrate, hemicelluloses, lignin, pectin, organic acids, tannin, water-soluble dyes
	Inorganic matter	Crude ash	Pure ash, organic residue

Standard values on six major components of the feed and the various substances contained in that component are widely available.

Assessing the overall quality of the animal feed

An ideal animal feed is supposed to supply animals' full requirements for energy and proteins. The ultimate

quality of feed is determined by the ability of the feed to supply energy and/or protein.

It is important to note that an animal can draw energy from CF, EE, NFE and CP, however the protein part of the diet is only derived from CP content of the feedstuff (Fig. 4.4).

After consuming the feed, the animal digests and metabolises the nutrients present in the feed. Like in humans, the health of an

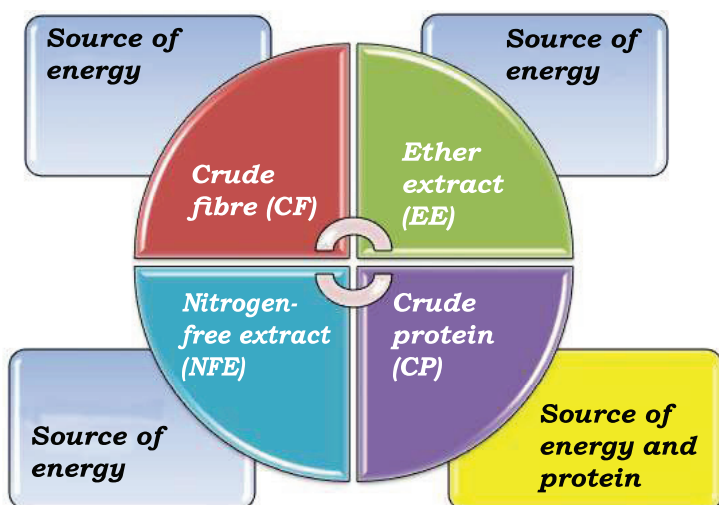


Fig. 4.4: Source of energy and protein in animal feed



individual depends not upon the total food consumed but on the digestibility of the consumed food, similar is the case with farm animals.

In farm animals, the digestible part of the feed/nutrient is that proportion which is metabolised and utilised by the animal and not excreted in the faeces. Therefore, the digestible part of the feed determines the availability of nutrients available to the animals for various functions like maintenance, growth, reproduction, production and work (draft).

Measurement of energy quality in animal feed

Concept of Total Digestible Nutrients (TDN)

Not all feed and fodder have equal nutritional profiles. Some feeds fully fill the animal's gut but provide small amount of actual nutrients for health, growth and production. There are some feeds which are extremely useful from the angle of utilisation of nutrients contained in them, and are usually more expensive. A high percentage of nutrients in these feeds help in digestion and provide energy to the animals.

TDN requirement of the animal changes according to the stage of the animal's life. For example, dry (out of milk) cows have much lower energy needs than lactating cows. Exotic and crossbred young heifers need more TDN than indigenous heifers. A calf eats less amount of TDN as compared to an adult cattle.

Calculating TDN in animal feed may look complicated at first, but it is a very useful tool for the dairy entrepreneur as knowledge of peak requirements of TDN of the animals is matched with peaks in fodder quality (leafiness or matured stem) to achieve lower cost of feeding. Besides energy, animals have other nutritional needs. TDN is just one aspect of animal feeding programme.

When we add digestible proportions of crude fibre (CF), crude protein (CP), ether extract (EE) and nitrogen-free extract (NFE) of a feedstuff, we get TDN value of the feedstuff. TDN is expressed as a percentage value and calculated as mentioned next.

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$$\text{TDN (\%)} = \text{digestible CF (\%)} + \text{digestible CP (\%)} + (\text{digestible EE (\%)} \times 2.25) + \text{digestible NFE (\%)}$$

In the above formula for calculating TDN, the multiplier of 2.25 is used with digestible EE because fat, i.e., EE has 2.25 times greater energy density per unit weight as compared to per unit of carbohydrate or protein.

When the amount of nutrients of any feedstuff is multiplied with its digestibility value, we get an idea of the actual quantity of nutrients that might be absorbed from that feedstuff. TDN is a bit different concept as it indicates the relative energy value of feed to an animal.

Measurement of protein quality in animal feed

Crude protein

The crude protein content of the feed is determined with the basic assumption that all the nitrogen present in a feedstuff is contained in the form of different proteins and all such proteins contain about 16 per cent nitrogen. Ruminants (like cow, buffalo, goat, sheep, etc.) have the ability to utilise and convert all the plant nitrogen into animal protein for different bodily functions.

The moisture, crude protein and total digestible nutrients found in different feed and fodder are given in Table 4.2.

Table 4.2: Average nutritive value of common feeds/ fodders on fresh weight basis

Kind of feeds	Name	Moisture (%)	CP (%)	TDN (%)
Concentrate feeds				
Grains	Maize	10	9.0	82
	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	45.0	75
	Mustard cake	10	36.0	74
	Cotton seed cake	10	21.6	70
	Sesame (Til) cake	10	45.6	78
Agro-industry by-products	Wheat bran	10	15.0	60
	Rice bran	10	9.6	65
	Rice polish	10	12.0	67
	Arhar Chuni	10	17.0	68
Animal by-products	Fish meal	7	55.0	65
	Meat and bone meal	5	40.0	69
Roughage				
Green fodders	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
	Rice 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

NOTES

Practical Exercise

Activity 1: Make a list of the feed ingredients and fodder in a dairy farm.

Material required

Feed ingredients, Fodder

Procedure

1. Visit a dairy farm.
2. Enlist the feed ingredients and fodder available in the dairy farm.

Check Your Progress

A. Multiple choice questions

1. Why do animals need feed?

(a) Maintenance	(b) Growth
(c) Lactation	(d) All of these
2. Which of the following is not considered under crude protein?

(a) Pure protein	(b) Non-protein nitrogen compounds
(c) Amino acids	(d) Lignin
3. In TDN estimation, which one of the following components is not included?

(a) Crude fibre	(b) Ether extract
(c) Minerals	(d) Crude protein
4. Which of the following is a characteristic of good feed?

(a) Bulky	(b) Rich in protein
(c) Free from toxins	(d) All of these

B. Fill in the blanks

1. Feed constitutes about _____ per cent of the total cost of animal production.
2. Wheat straw contains TDN of about _____ per cent.
3. In calculation of TDN, digestible EE is multiplied with a figure of _____.
4. EE has _____ times greater energy density per unit weight as compared to per unit of carbohydrate or protein.
5. The crude protein content of the feed is determined with the basic assumption that proteins contain approximately _____ per cent nitrogen.

C. Mark true or false

1. The TDN requirements change according to the stages of animal's life.



2. Silage is considered as concentrate feed.
3. A good animal feed has high carbohydrate content.
4. Concentrate feed is more expensive than roughage.
5. Inorganic matter present in the feed is categorised as minerals.

D. Match the following

- | A | B |
|------------------|--------------------|
| 1. Ether extract | (a) Amino acid |
| 2. Crude fibre | (b) Hemicelluloses |
| 3. Ash | (c) Fat |
| 4. Crude protein | (d) Cellulose |
| 5. NFE | (e) Minerals |

E. Crossword

	¹ H	² L		³ B
⁴ M			Z	
	Y	G		
				E
⁵ T		N		
				M

Across

4. Grain commonly used in concentrate mixture
5. Total digestible nutrients

Down

1. Process of conservation of green fodder
2. Major portion of crude fibre consist of
3. Popular leguminous fodder cultivated in rabi season

SESSION 2: FEEDING OF DAIRY ANIMALS

Dairy animals consume mainly two types of feed—concentrates and fodder (Fig. 4.5). Fodder may be either in green form or dry form. It is always better to meet an animal's nutrient requirement from good quality green fodder, as its nutritive value is equivalent to concentrate mixture. The concentrate requirements can be replaced by good quality green fodder to a certain extent.

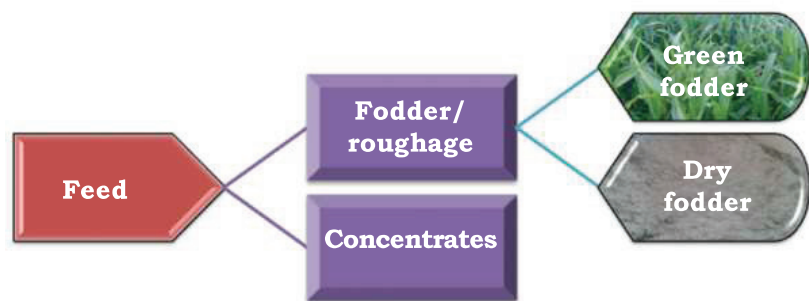


Fig. 4.5: Broad classification of feed

Animals require feed for various purposes such as maintenance, growth, lactation, pregnancy and work, i.e., draft. The major purposes for which feed is uniquely needed for special function in the animal are explained in Fig. 4.6.

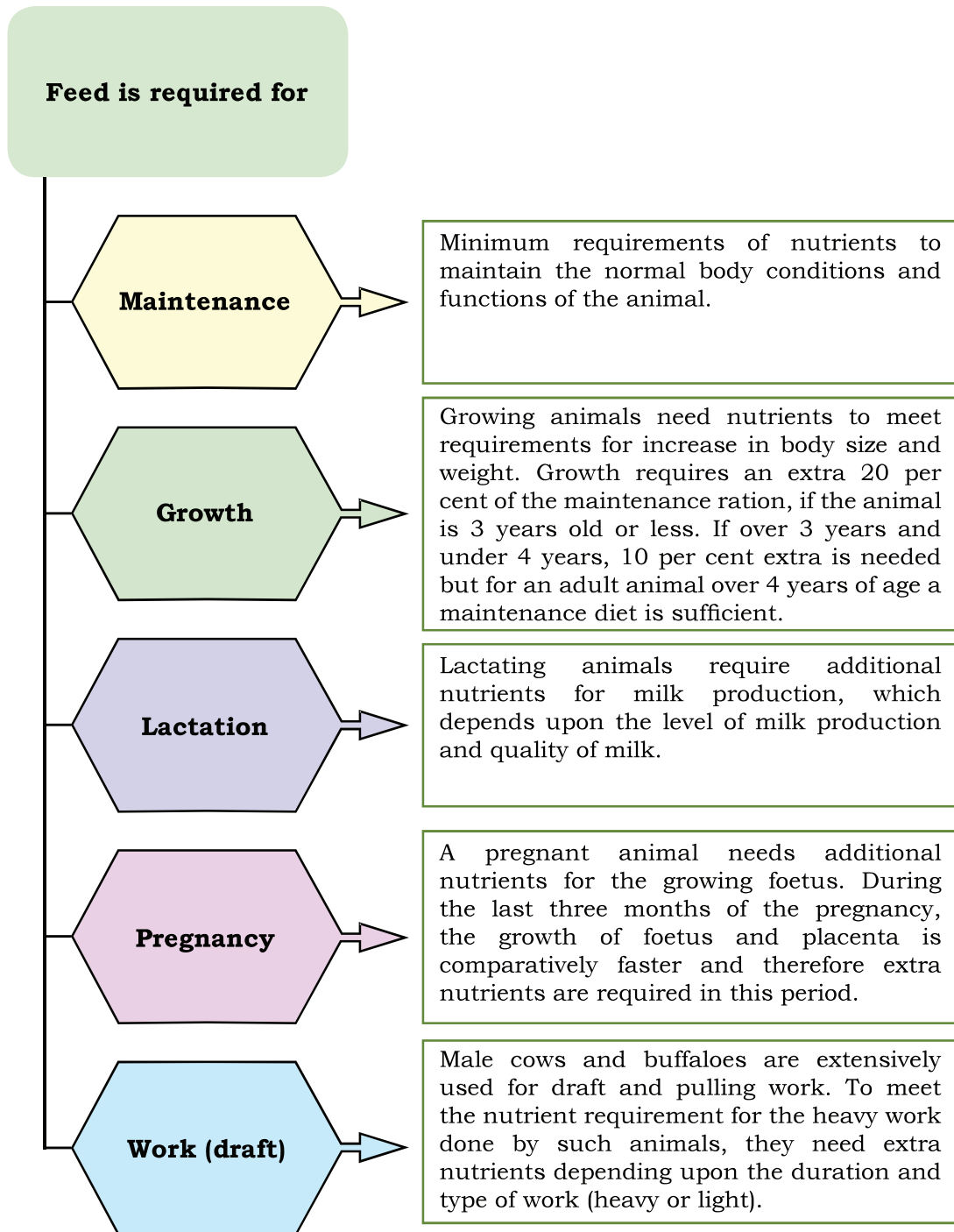


Fig. 4.6: Purposes for which feed is required by the animals



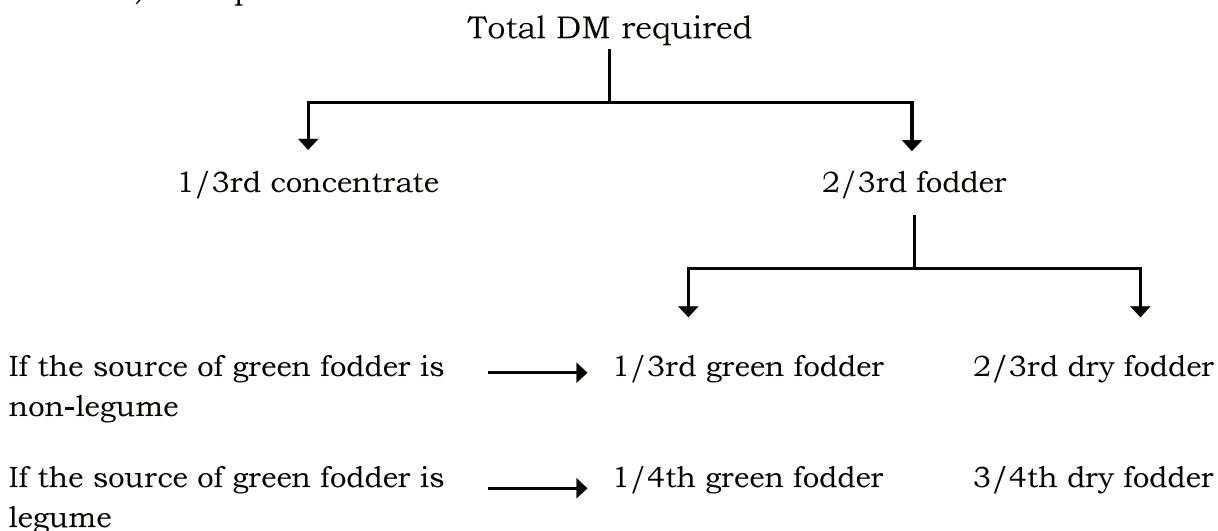
Feed requirements based on thumb rule methods

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

Feed requirements for maintenance based on dry matter

All feeds contain some amount of water. If all the water of a feed is taken out, the remaining content of the feed is termed as dry matter (DM). DM intake is the amount of feed the animal consumes per day less the moisture content in that feed. Animals need to consume a certain amount of DM per day to maintain health and production. Daily DM requirements of indigenous breeds of cattle are about 2.0–2.5 per cent of their body weight. Crossbred cows and buffaloes daily consume higher DM, i.e., 2.5–3.0 per cent of their body weight.

Another largely followed simple thumb rule of animal feeding followed by majority of farmers is to meet the total DM requirement of the animal in such a way that one-third of the DM is met from the concentrate and the remaining two-third from fodder (green and dry). Availability of leguminous green fodder which is rich in protein, however significantly reduces the requirement of green fodder to fulfil the nutrient requirement of the animals, as explained below.



Feed requirements on the basis of various stages of production

Considering the stages of production of the animal and to meet its nutritional needs completely, a more refined rule of thumb is followed (Table 4.3).

Table 4.3: Straw/dry fodder and concentrate requirement for various stages of production

Category of animals	Stages of production				
	Maintenance		Milk production	Pregnancy (extra feed for pregnant animal over 5 months)	Growth (extra feed for growth)
	Straw/dry fodder (kg)	Concentrate (kg)	Concentrate	Concentrate (kg)	Concentrate (kg)
Indigenous cattle	4–5	1.25	0.4 kg / litre milk yield	1.25	1.00
Crossbred cattle	4–6	2.00	0.4 kg / litre milk yield	1.75	1.00
Buffaloes	4–6	2.00	0.5 kg / litre milk yield	1.75	1.00
Breeding bull	As per free choice of the animal	2.50	–	–	–
Bullock (working over 4 hrs daily)	As per free choice of the animal	3.00	–	–	–

Besides the quantity of straw/dry fodder and concentrate as shown in Table 4.3, about 15–20 kg green fodder is provided to the animals to meet their total nutritional requirements.

Feed requirements based on scientific feeding standards

Feeding standards are a description of the exact quantity of all the nutrients required by the animals for maintaining their health and production. In calculating these standards, the body weight of the animal is the primary criterion. Besides this, for every litre of milk production, the corresponding requirement values are given. Feeding standards have been developed through



experimentation, and have been modified and upgraded from time to time and contain the requirements of nutrients in tabular form.

Some of the popular feeding standards are NRC (National Research Council)—the feeding standard of America, ARC (Agricultural Research Council)—the feeding standard of UK, and ICAR (Indian Council of Agricultural Research)—the feeding standard of India.

Feed supplements for optimum growth and production

Feed supplements are substances which are added in small quantities to a ration to stimulate growth, production and improve efficiency of feed utilisation in the animals. Feed supplements are non-nutritive in nature and added for:

- (i) preserving nutritional properties of stored feeds (i.e., antioxidants and mould inhibitors);
- (ii) facilitating feed pelleting (i.e., in their action as emulsifiers, stabilisers and binders);
- (iii) facilitating growth (i.e., antibiotics and hormones);
- (iv) facilitating feed ingestion and consumer acceptance of the product (i.e., colours); and
- (v) supplying essential nutrients in purified form (i.e., vitamins, minerals, amino acids, cholesterol and phospholipids).

Major ingredients for feed preparation

Like humans, animals 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, and therefore, various ingredients are mixed for a well-balanced ration. The major categories of feed ingredients used for preparation of rations for dairy animals are given in Table 4.4.

Table 4.4: Major categories of feed ingredients used for preparation of rations

Categories	Common ingredients
Cereals	Maize, wheat, barley, sorghum, millet, etc.
Oil cakes	Soybean, groundnut, rapeseed, cotton seed, sesame, mustard, etc.

NOTES

Agro-industry 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 (DCP), limestone, oyster shells, dolomite stone, etc.
Other items	Molasses, vegetable oils, jaggery, etc.

Various feed ingredients have been shown in Fig. 4.7 (a–f).

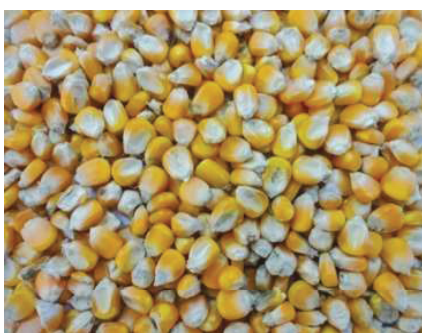


Fig. 4.7 (a) Maize



Fig. 4.7 (b) Wheat bran



Fig. 4.7 (c) Cotton seed cake



Fig. 4.7 (d) Rice polish



Fig. 4.7 (e) Mustard cake



Fig. 4.7 (f) Soybean meal cake

Fig. 4.7 (a–f): Various feed ingredients used for preparation of concentrate mixture



Check Your Progress

NOTES

A. Multiple choice questions

1. Daily DM requirements of indigenous breeds of cattle are about _____ of their body weight.
(a) 0–1.5% (b) 2.0–2.5%
(c) 3.0–3.5% (d) 4.0–4.5%
2. Which of the following is not considered a cereal?
(a) Maize (b) Wheat
(c) Barley (d) Mustard cake
3. Which of the following is considered an agriculture by-product?
(a) Rice polish (b) Soybean cake
(c) Groundnut cake (d) Rapeseed cake
4. Which of the following is the Indian feeding standard?
(a) ARC (b) NRC
(c) ICAR (d) ICMR

B. Fill in the blanks

1. Dairy animals consume mainly two types of feeds—concentrate and _____.
2. Minimum nutrients required to maintain the normal body conditions and functions of the animal are known as _____.
3. When water is taken out from the feed, then the remaining part is termed as _____.
4. _____ are substances which are added in small quantities to a ration to stimulate growth, improve efficiency of feed utilisation and overall health of the animals.
5. As per rule of thumb, in buffaloes one kg concentrate is required for every _____ kg/litre milk production.

C. Mark true or false

1. Fodder is always available in green form.
2. Nutritive value of good quality green fodder is equivalent to concentrate mixture.
3. All feeds contain some amount of water.
4. In young animal, a single feed ingredient can meet the total nutrient requirement.
5. Feed supplements are non-nutritive in nature.

D. Match the following

- | A | B |
|---------------------|--------------------------|
| 1. Cereals | (a) Fish meal |
| 2. Oil cakes | (b) Di-calcium phosphate |
| 3. Animal proteins | (c) Rice polish |
| 4. Mineral sources | (d) Maize |
| 5. Agro by-products | (e) Mustard |

E. Crossword

	¹ M	² S			
				³ G	
⁴ F					
	T				
D	A	E			
⁵		A	F		
	D			H	
R					

Across

5. Another term used for animal power

Down

1. Type of oil cake
2. Oil cake which contains high percentage of crude protein
3. Nutrient requirement of young animals other than maintenance
4. Feedstuff used specifically to feed domesticated livestock such as cattle



Fig. 4.8: Electrically operated chaff cutter

SESSION 3: PREPARATION OF ANIMAL FEED

Equipment used in chaffing of green fodder

Dry fodder like wheat straw can be fed to the animals as such without any preparation and therefore does not require machines. However, green fodder requires chaffing before feeding to the animals. Chaff cutter (Fig. 4.8) is used to chaff the green fodder, which cuts the fodder into very small pieces. Chaffed fodder is more palatable and reduces fodder wastage from the manger. Two types of chaff cutter are available in the market—manual and electrically operated.



Basic equipment/machines required for the preparation of concentrate mixture

Concentrate is the mixture of various feed ingredients, and can be prepared in the farm itself. Feed ingredients like grains, cake flakes are grounded with the help of a feed grinder to get a uniform mixture of feed items (Fig. 4.9). Afterwards, all the feed ingredients and feed supplements are added and mixed as per the feed formula. Mixing can be done manually on the mixing floor or through an electrically operated mixer (Fig. 4.10).



Fig. 4.9: Electrical feed grinder

Maintenance of equipment/machinery

Machines are cleaned regularly and kept in safe and working condition. The different devices used in the manufacture of feed and feed ingredients are periodically tested for accuracy. Records of all maintenance works carried out on equipment and machinery are kept for future reference.

Preparation of feed at the farm

Ingredients used for preparation of concentrate mixture

In order to get a balanced feed, different feed ingredients are mixed in suitable proportion. This type of mixture is known as concentrate mixture or compound cattle feed. The composition of cattle feed depends on the



Fig. 4.10 (a)



Fig. 4.10 (b)

Fig. 4.10 (a-b): Semi-automatic vertical feed mixer

NOTES

type of animals, milk production, season, etc. This concentrate mixture is fed to the animals along with roughages (green and/or dry). Concentrate mixture is fed to animals in the form of mash, pellets, crumbles or cubes. Various feed items included for preparation of concentrate mixture are given in Table 4.5.

Table 4.5: Various feed items included in the concentrate mixture

Grains	Maize, sorghum, wheat, oat, barley, millets, etc.
Brans	Rice bran, wheat bran, de-oiled rice bran, rice polish
Oil cakes	Cakes of mustard, cotton seed, groundnut, soybean, rapeseed, sunflower, linseed
Animal protein source	Fish meal, bone meal, meat meal
Chunnies	Moong, arhar, gram, guar, tur and other locally available pulses
Agro-industry by-products	Molasses, tamarind seed powder, tapioca waste, etc.
Minerals and vitamins	Mineral mixture, Di-calcium phosphate, common salt, Vitamin A, Vitamin D3 and Vitamin E

Composition of concentrate mixture

Since animal feed alone accounts for about 70 per cent of the total cost of milk production, balanced and economical feeding of dairy animals plays a pivotal role in successful dairy farming. Good quality animal ration is balanced in all nutrients and simultaneously economical. The proportion of ingredients to be incorporated in the ration are selected on the basis of their prices in particular seasons. The usual proportion of various ingredients in daily concentrate mixtures in medium yielding dairy cattle are given in Table 4.6.

Table 4.6: Ingredients in daily concentrate mixtures of medium yielding dairy cattle

Ingredients	Proportion (%)
Grain	35–40
Oil cakes	32–35



Agricultural by-products (brans, chunnies, agro-industrial by-products, etc.)	25–28
Mineral mixture and vitamins	2
Salt	1

Steps in preparing concentrate mixture at farm level

Fig. 4.11 shows the various stages in the preparation of concentrate mixture at the farm level undertaken by a dairy farmer. Various steps carried out for preparation of concentrate mixture are shown in Fig. 4.12.

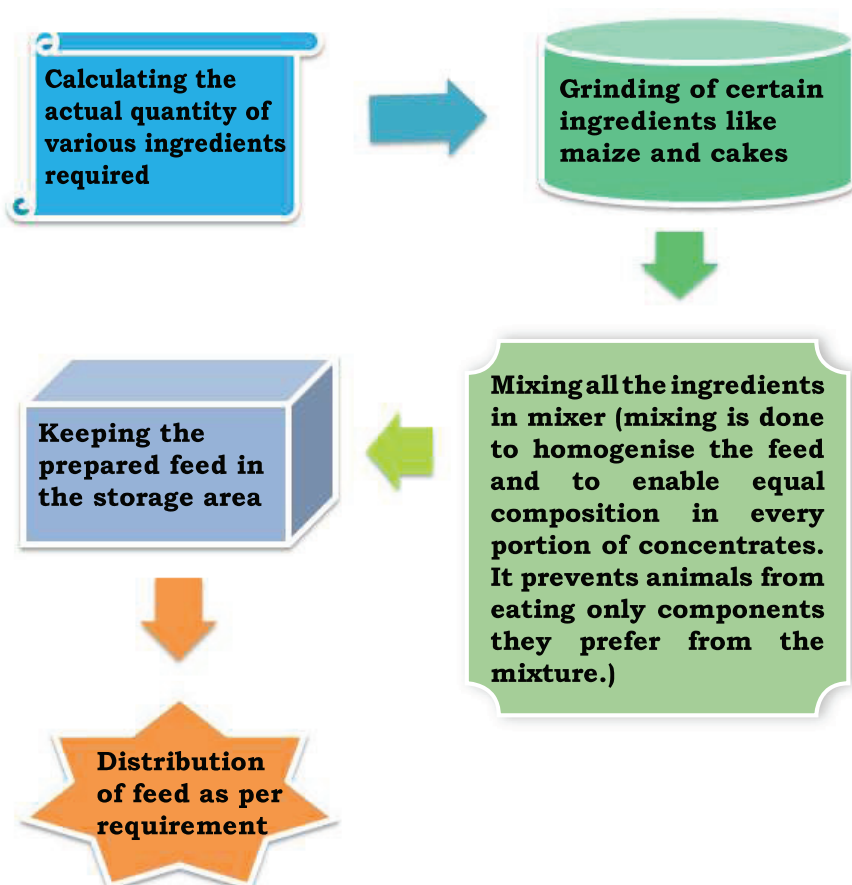


Fig. 4.11: Various stages in the preparation of concentrate mixture at the farm level

Following precautions are taken during concentrate mixture preparation.

- Grind maize and other grains shortly before use.
- The grinding process releases the oils in the germs of the grains which are grinded for preparation of



Fig. 4.12: Steps of preparation of concentrate mixture

concentrate mixture. The released oil contains poly-unsaturated fats and some amount of natural antioxidants. Rancidity can occur within days or weeks after grinding, necessitating inclusion of ground grain in the concentrate mixture only at the time of feeding to the animals.

- (iii) Separate storage areas for raw material and finished products are provided to prevent cross-contamination.
- (iv) The feed is kept dry (less than 12 per cent) to prevent fungal or bacterial growth.
- (v) Store feed in closed bags in a cool dry place.
- (vi) Prevent rodent and insect infestation.
- (vii) Stock inventory is properly managed to ensure that neither raw material nor finished feeds deteriorate prior to use or during storage.



Maintaining feed inventory

Periodic actual counting of different feed items in storage area is termed as feed inventory. As already explained, the feed cost is one of the largest expenditure in dairy farming. Careful monitoring of feed inventory helps the dairy entrepreneur in controlling the feed costs and maximising profitability. Feed inventory is a valuable tool for determining available feed supply and estimating future needs of total feedstuff for the herd. The inventory is adjusted for losses caused on account of storage and losses during feeding animals. A simple feed inventory for the incoming feed is shown in Table 4.7 for the beginners in dairy farming business.

Table 4.7: A sample feed inventory

S. No.	Date of receipt of feed	Source/ supplier of feed	Description	Quantity	Storage area	Sampled (Yes/No)	Signature of the person handling the feed

Benefits of concentrate mixture prepared at the farm

Underfeeding of animals can lead to low productivity and poor health condition. Overfeeding causes loss of nutrients and increased expenditure on feed. Hence, animals are fed as per their exact feed requirement. Many dairy entrepreneurs choose to manufacture concentrate mixture at the farm itself to control feed costs. In order to produce concentrate mixture of high quality, good quality feed ingredients are purchased from the market and concentrate mixture is prepared as per the feed formulation formula.

Farmers often have little or no control over the quality of feeds that they purchase from the market. The use of sub-standard feed ingredients results in low production and poor returns to the farmer. In many instances, adulterants are used in the concentrate procured from the market to satisfy the laboratory

testing. Farm-made concentrate mixture is a cheaper option compared to the concentrate mixtures available in the market. Therefore, if possible, it is better to prepare concentrate feed at the farm itself.

Procurement, checking and receiving of animal feed

You have so far learnt that for calculation of feed requirements of the animals, the following factors are given due consideration.

- (i) Protein content and protein quality of feedstuff
- (ii) TDN content of feedstuff
- (iii) Feed requirement of different categories of animals
- (iv) Major feed ingredients required to formulate a given concentrate

Based on an understanding of the above-mentioned factors, requirement of animals' feed is calculated on daily or monthly basis. Attention is also given to the following factors while making supply order for feed items (Fig. 4.13).

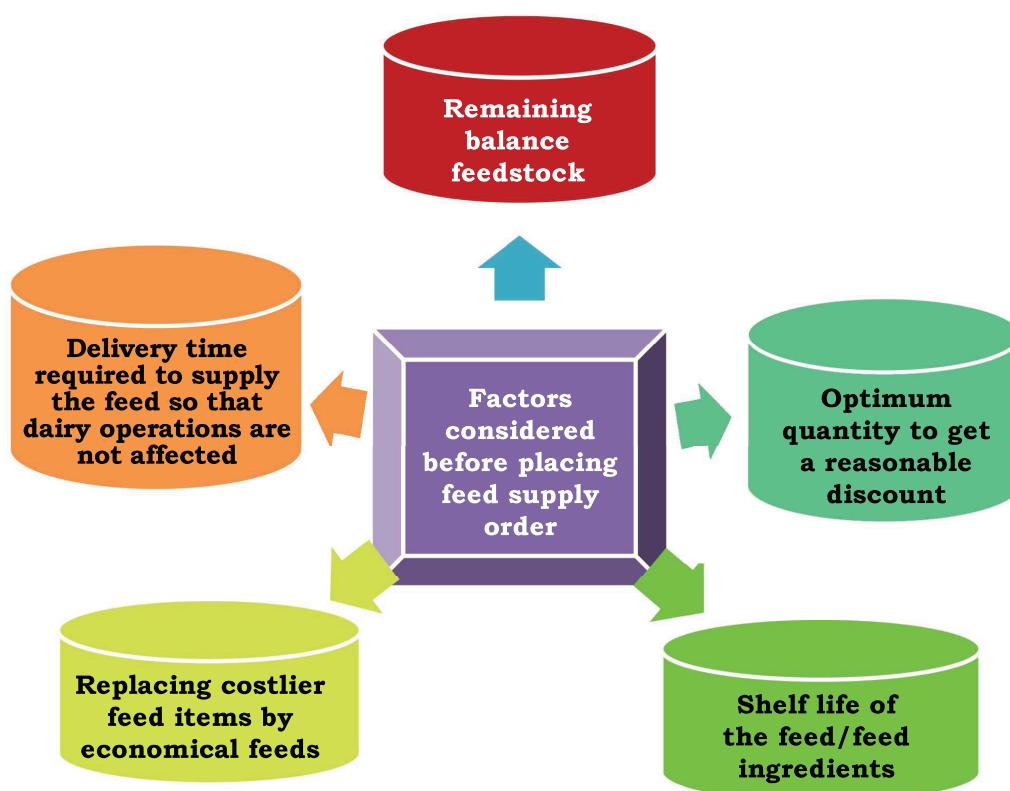


Fig. 4.13: Factors considered before placing feed supply order



The various activities included in procurement, checking and receiving of animal feed in a dairy farm are explained in Fig. 4.14.

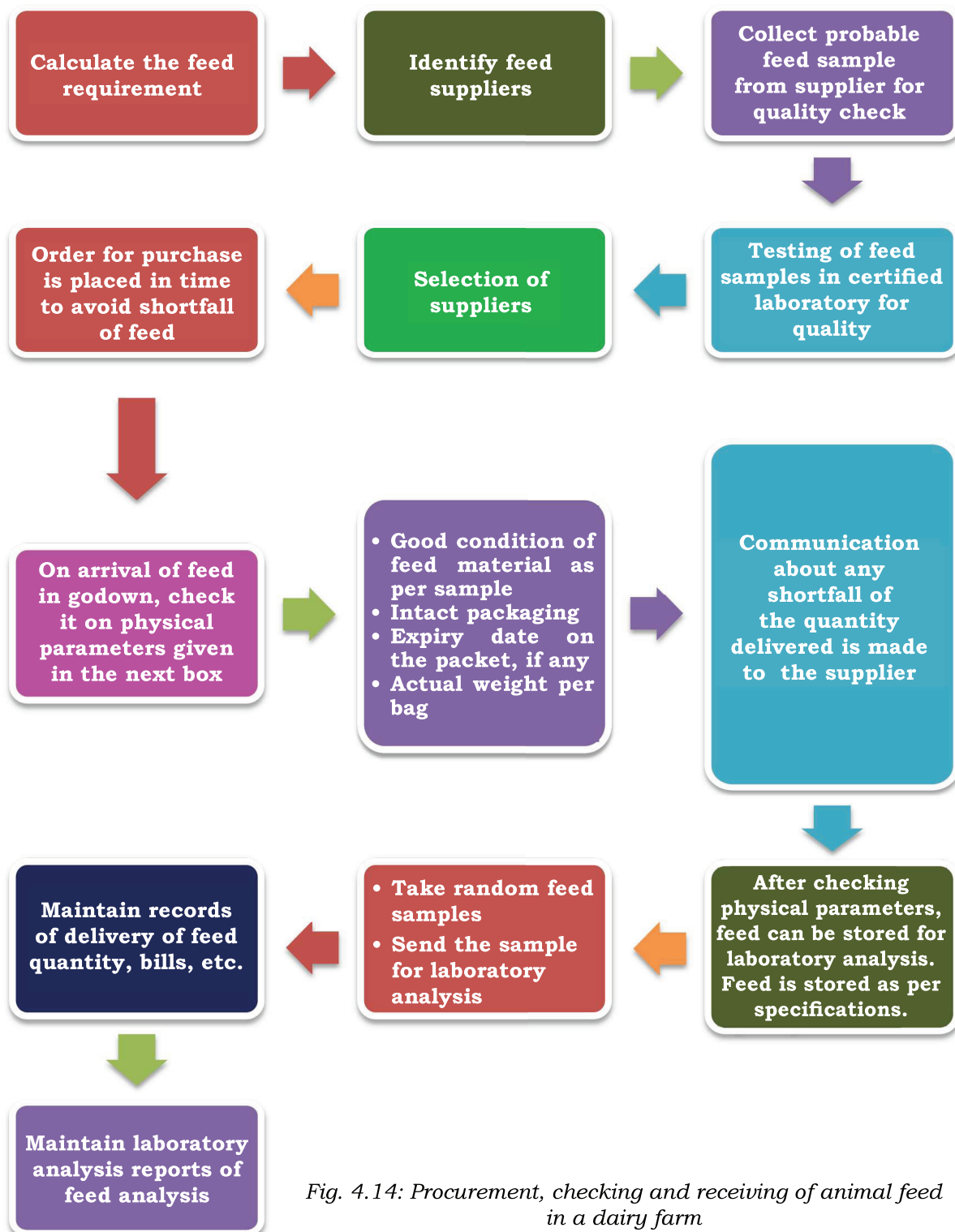


Fig. 4.14: Procurement, checking and receiving of animal feed in a dairy farm

NOTES

Storage of animal feed

Large amounts of stored feed are usually damaged by rodents and insects, which leads to substantial losses of nutrients and their palatability decreases. It also leads to mould and other harmful growth and accumulation of harmful toxins in the feedstuff. Therefore, it is essential to store the feed properly for efficient dairy farm management.

Safe and scientific storage of animal feed

The following factors are considered for safe and scientific storage of animal feed.

Site selection

The storage structure is located on a raised and well-drained site. Accessibility is also an important factor kept into consideration. The site must be free from dampness, excessive heat, insects, rodents, termites, etc.

Selection of proper structure for storage

The structure for storage of feed depends on the quantity of feed to be stored and the period of storage. In case of godown storage and CAP (cover and plinth) storage, sufficient space is provided between two stacks, between stacks and the walls, to ensure proper aeration.

Cleaning of bags

New gunny bags are preferred. Second-hand gunny bags disinfested by boiling them in disinfectant solution and fully dried before filling the feed in them, could also be used.

Cleaning and fumigation of storage structure

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

Drying of feed

Feed ingredients are properly dried to avoid quality deterioration before storing them.



Height of the platform

The storage platform is sufficiently high so that the store is free from moisture/water seepage (Fig. 4.15).

Proper aeration

Proper aeration is provided during dry and clean weather and care is taken to avoid the aeration in rainy seasons to protect the stock from infections due to excess moisture.

Height of the stored material

On concrete floor the feed material may be stored up to a height of 5 meters only, as shown in Fig. 4.16.

Separate storage for new and old stock

To prevent contamination in new stock from the old stock, it is advised to store them separately.

Regular inspection

To maintain proper health and hygiene of stock, regular inspection of stored feed ingredients is necessary. Periodic fumigation is carried out in case of storage for long duration.

Common structure for storage of feedstuff

Storage structure is selected based on the available structural material and type of feedstuff to be stored. Traditionally, feed ingredients are stored in country-made storage structures prepared from the locally available material. Nowadays, improved storage structures are available with more storage capacity and with proper protection to prevent storage losses. Fig. 4.17 shows various structures used for storing the feed ingredients.



Fig. 4.15: Feed godown on raised platform



Fig. 4.16: Feed ingredients stored in bags and arranged in stacks

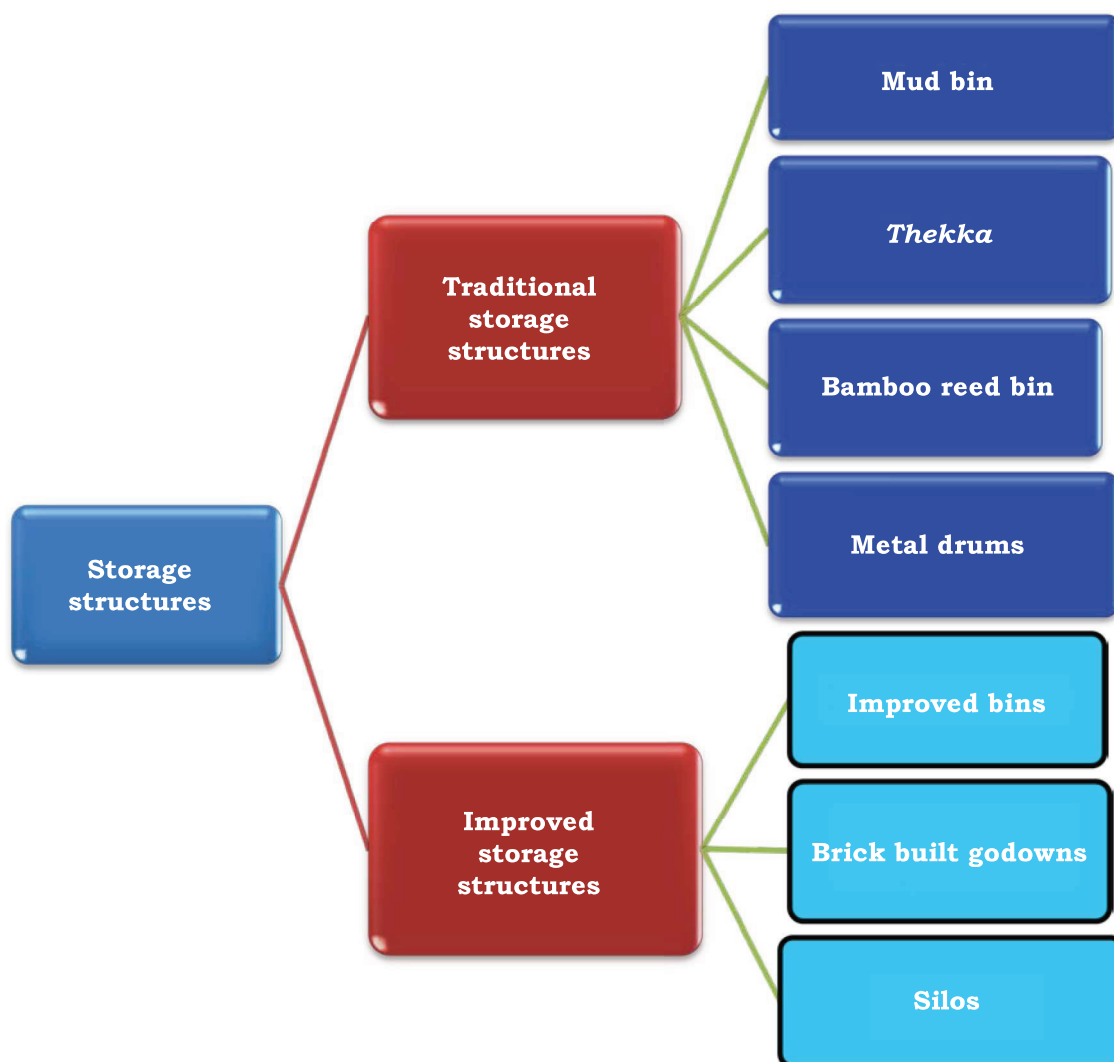


Fig. 4.17: Various structures for the storage of animal feeds

Practical Exercise

Activity 1: Prepare concentrate mixture in a nearby cattle feed mill.

Material required

Feed ingredients, Feed grinder, Feed mixer

Procedure

1. Visit a nearby cattle feed mill.
2. Grind ingredients like maize and cakes in a feed grinder.
3. Mix all the ingredients in a feed mixer.
4. Keep the prepared feed in the storage area.



Check Your Progress

NOTES

A. Multiple choice questions

1. Which of the following is considered a traditional storage structure?
(a) Silo (b) Brick built godowns
(c) Improved bins (d) Mud bin
2. In which form can the concentrate mixture be offered to animals?
(a) Mash (b) Pellets
(c) Crumbles (d) All of these
3. What type of ingredients are commonly used for the preparation of concentrate mixture?
(a) Grain (b) Oil cakes
(c) Mineral mixture (d) All of these
4. Feed supplements are used in the animal feed to _____.
(a) facilitate feed pelleting
(b) preserve nutritional properties of stored feeds
(c) facilitate growth
(d) All of the above

B. Fill in the blanks

1. _____ is used to grind the feed items.
2. To get a balanced feed, _____ is mixed in suitable proportion.
3. For the storage of the feed, the moisture content of feed must be less than _____ per cent.
4. Proper aeration is provided during dry and clean weather but care is taken to avoid aeration in _____ season to protect the feed stock from moisture.
5. Large quantities of stored feed are usually damaged by _____.

C. Mark true or false

1. Rice polish and wheat bran are used in concentrate mixture as a source of protein.
2. All feed ingredients used in the concentrate mixture need to be grinded before mixing.
3. Chaffed fodder is less palatable to the animals.
4. Good ration for animals is balanced and economical.
5. The feed storage platform is sufficiently high to avoid theft.

D. Match the following

- | A | B |
|-----------------|--|
| 1. Silo | (a) Mix the feed after grinding |
| 2. Mud bin | (b) Grind the feed ingredients |
| 3. Mixer | (c) Improved feed storage structure |
| 4. Grinder | (d) Traditional feed storage structure |
| 5. Chaff cutter | (e) Chaffing of green fodder |



NOTES

E. Crossword

¹ G				D		R
O						
²	R		³ M			
		⁴ S			O	
			X			
N						
			R			

Across

- Machine for grinding grains
- Traditional method of storing feed
- Large feed storage structure usually maintaining anaerobic condition

Down

- In a farm, feeds are temporarily stored in a place before offering to the animals
- After grinding of the feed ingredients, the machine used to mix the feed ingredients uniformly

SESSION 4: MAINTAINING FEED AND WATER SUPPLY

Cattle require regular supply of feed and fresh water. Systematic planning is required to ensure that uninterrupted feed and water is available to the animals. Following three components are involved in planning regular feed and water supply to the animals.

- Material (feedstuff and water)
- Man (labour)
- Machinery (such as water pump, feed grinder and mixer, etc.)

If any one component gets disturbed, the supply of feed and water gets hampered. Table 4.8 shows the broad plan to ensure the availability of feed and fodder and Table 4.9 shows the broad plan to ensure availability of water in the dairy farm.



Table 4.8: Broad plan to ensure availability of feed and fodder

Type of feedstuff	Planning
Concentrate mixture	Most of the ingredients used for the preparation of concentrate mixture are available at reasonable prices during the harvesting season. However, long-term storage of these items may lead to infestation and damage by insects and rodents. Therefore, these losses can be kept into consideration before storing the ingredients for longer period.
Feed supplements	Feed supplements are regularly added to the ration of the animals. After evaluation of the price and quality, these feed supplements can be purchased and stocked, if necessary.
Dry fodder (wheat straw, etc.)	During harvesting season, wheat straw is readily available at discounted prices. Once stored properly, it can be used for a longer period. Quantity of straw required for the whole year is estimated in advance. Accordingly straw is stored in the farm in such a way that it can be used till the next harvesting or procurement season.
Hay and Silage	These are usually prepared on the farm itself. When the green fodder is scarce, hay and silage are usually fed to the animals.
Cultivating forage for feeding of animals	Green fodder crops can be easily grown throughout the year. Cultivation, harvesting and supply of green fodder to the animals is planned in advance.

Table 4.9: Broad plan to ensure regular supply of water

Water required for	Planning
Drinking	Watering points are constructed in such a way that each animal has free access to water throughout the day and night. The quality of drinking water for animals is assured. In summer months, animals need more water, therefore sufficient water supply is made available.
Cleaning of sheds and surrounding	Daily cleaning of the sheds and surrounding is quite important, otherwise chances of disease incidence will be higher.
Washing of animals	Milking animals are regularly washed just before milking. Other categories of animals may be washed daily. In summer, at least two times washing is required to avoid stress due to extreme heat.

NOTES

Water requirement of dairy animal

Water is the major constituent in the animal body. Adult animal body contains about 65 per cent water. While deprivation of food for a short period is not fatal to the animal, the deprivation of water can prove fatal. Water is regularly lost from the animal body through urine, faeces, exhaled air and skin. In addition, milking cows lose water through milk (contain about 87% water). The requirement of water increases along with milk yield, high protein diet, non-availability of succulent green fodder and climatic condition (hot summer months). Preferably water is made available to the animals throughout the day and night. Besides drinking water, a large amount of water is also required in a dairy farm for washing of animals and cleaning of animal shed. Various factors which affect the water requirement of dairy animals are given in Fig. 4.18.

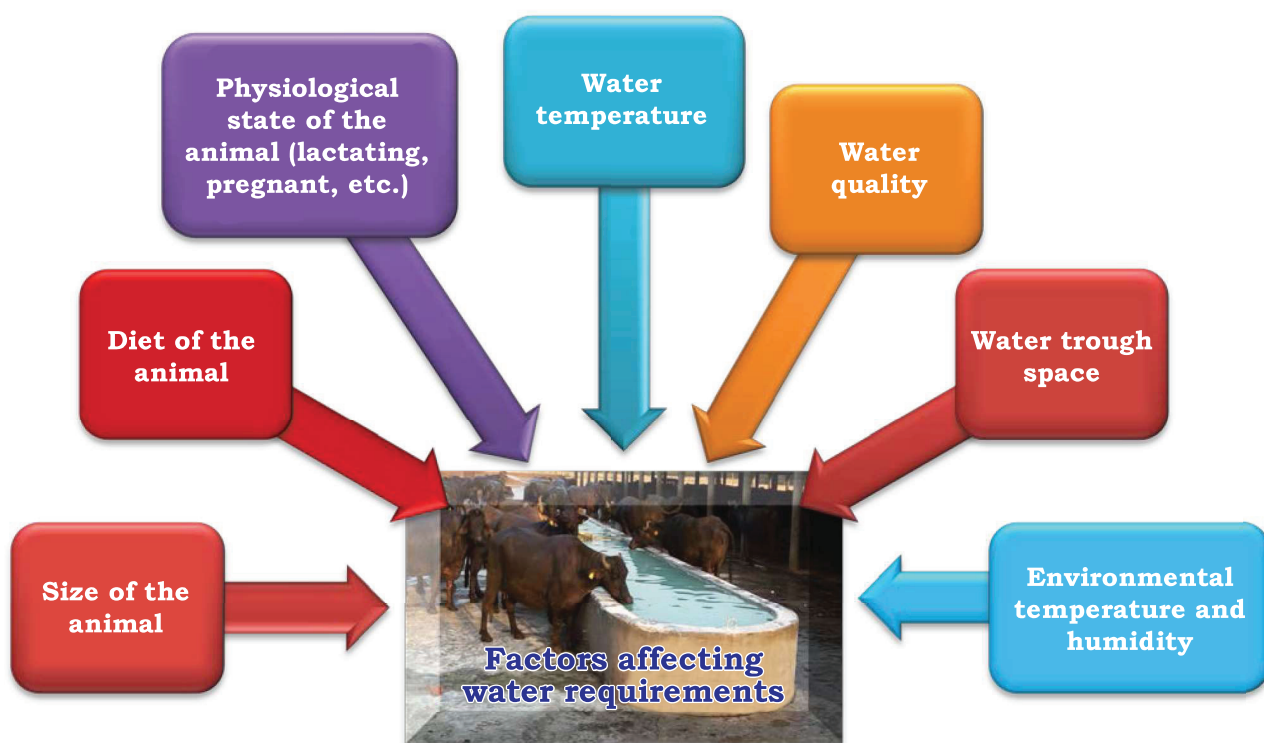


Fig. 4.18: Factors affecting water requirement of cattle



Salient points regarding watering of dairy animals

NOTES

- (i) Dairy animal drinks water several times in a day. Total water intake in a day depends upon the type of feed available to the animals and milking status of the animal (milking or dry).
- (ii) Cattle generally drink 30 to 40 per cent of daily water requirement within 1 hour of milking.
- (iii) Temperature of drinking water: Cattle like to drink water in the range of 17–27°C rather than very cold or hot water.
- (v) Minimum water depth in the water trough: Water depth of a minimum of 3 inches is maintained to allow the animals to submerge their muzzles 1 to 2 inches deep in water.
- (v) Watering point: For each group of animals, at least two watering points (water troughs) are required in a paddock (Fig. 4.19). It facilitates water intake by all the animals as per requirement without disturbance of dominant animals in the group.



Fig. 4.19: Watering points for a group of buffaloes

As a rule of thumb, water intake is about 8–10 per cent of body weight during favourable environmental conditions. It may reach to 13–14 per cent of body weight during hot weather.

Thus, a 400 kg cow producing 10 litres of milk is provided with $\{[(400 \times 10\%) + (1.5 \times 10)] \text{ litres} = [40 + 15]$



litres= 55 litres} 55 litres of drinking water. In addition to this, about 70–75 litres of water is required for washing of animals and cleaning of shed. Thus, the minimum daily water requirement for a cow is about $55+75= 130$ litres.

Salient aspects of planning feed and water supply to animals

- (i) The dairy entrepreneur understands the basic behaviour of the animals and treats them accordingly. The farm workers need to be trained on the importance of maintaining cleanliness and hygiene.
- (ii) Feed and fodder are supplied at least twice daily. Therefore, total required daily quantity of feed and fodder is divided into two parts and supplied to the animals at regular intervals.
- (iii) It is better to mix chopped green fodder, straw and concentrate mixture to increase the feed intake and better utilisation of feed by the animals (Fig. 4.20).
- (iv) Feed is given to sick animals as per veterinarian's recommendations.



Fig. 4.20: Mixing chopped green fodder, straw and concentrate mixture for better utilisation of feed by the animals



- (v) In extreme summer months, major quantity of feed is preferably supplied during night.
- (vi) Regular observations on feeding and drinking habits of animals are made. Marked changes in feeding and drinking pattern of particular animal is an indication of adverse health conditions.
- (vii) Feeding manger is cleaned daily. Any leftover and stale feed is discarded as per standard waste disposal methods.
- (viii) The equipment and machinery used for feed and water supply are cleaned regularly and maintained properly.
- (viii) Water troughs are cleaned and dried every fortnight and lime is painted on the inner walls of the water troughs to check the growth of algae.
- (ix) Special attention is given to the young, sick, injured animals, and animals in advanced pregnancy.
- (x) The workers serving feed to the animal are expected to have a compassionate approach towards the animals.

Causes of feed wastage and measures to minimise it

In every farm some amount of loss of feed is inevitable. Feed losses on farm occur during the following stages.

- (a) *Storage of feed*: During storage of feed a major amount of feed is wasted due to the infestation of insects, rodents, etc.
- (b) *Preparation of feed*: During grinding and mixing, some amount of feed is liable to be wasted.
- (c) *Feeding of animals*: Animals generally spill and waste feed. Such a wasted feed is wet and covered with saliva of the animal, and is susceptible to spoilage. If this feed is left in manger, animals do not consume it. This wasted feed is a breeding ground for flies and attracts rodents, etc.

Following efforts are undertaken to minimise feed wastage.

- (i) Choose an appropriate storage container.
- (ii) Proper rodent control programme is ensured.

- (iii) Feed are stored in cool and dark place.
- (iv) At the time of purchase of feed ingredients, it is ensured that the feed ingredients contain only acceptable level of moisture.



Fig. 4.21: Animals offered fodder in a continuous manger

- (v) Manger is designed to reduce feed wastage.
- (vi) Manger is cleaned on regular basis so that spoiled or rotten feed can be removed.
- (vii) Feed is offered to the animals strictly as per requirement.
- (viii) In case of group feeding in continuous manger (Fig. 4.21), proper grouping of animals (on the basis of body size or age) is ensured.

Practical Exercise

Activity 1: Calculate the total water requirement for a lactating cattle during summer, in a dairy farm.

Procedure

1. Visit a nearby dairy farm.
2. Measure the body weight of the cattle by taking the cattle to the animal weigh bridge.
3. Note down the average daily milk yield of the cattle from the records of the farm.
4. Calculate water requirement for the maintenance and milk production as per the given formula.
5. Calculate water requirement for washing of shed.
6. Calculate extra water requirement during summer season.
7. Add up all the requirements.

Check Your Progress

A. Multiple choice questions

1. Which of the following animal feed is chopped before feeding?

(a) Wheat straw	(b) Green fodder
(c) Concentrate	(d) None of these
2. Continuous manger is suitable for _____.

(a) group feeding	(b) individual feeding
(c) both (a) and (b)	(d) None of these



3. Water requirement of the animals depends upon _____.
 (a) body weight
 (b) diet
 (c) environmental temperature
 (d) All of the above
4. Long-term storage of ingredients (for concentrate mixture) could lead to _____.
 (a) insect infestation (b) damage by rodents
 (c) loss of moisture (d) All of these
5. Which of the following is important in planning regular feed and water supply to the animals?
 (a) labour (b) machinery
 (c) feedstuff (d) All of these

B. Fill in the blanks

1. About _____ litres of water is required daily for adult cattle.
2. Water troughs are cleaned every _____ days to check the growth of algae.
3. Water depth of minimum _____ inches is provided to the livestock to submerge their muzzle 1 to 2 inches deep in water.
4. As a rule of thumb, water intake by the cattle is about _____ per cent of body weight during favourable environmental condition.

C. Mark true or false

1. Hay contains more moisture than silage.
2. Feed and fodder are supplied at least twice daily.
3. Leftover feed is susceptible to spoilage.
4. During storage of feed, some amount of feed is wasted due to the infestation of insects, rodents, etc.

D. Match the following

- | A | B |
|------------------------|--|
| 1. Grinder and mixer | (a) Wastage of feed during storage |
| 2. Insects and rodents | (b) Leftover feed |
| 3. Manger | (c) Usually feed supplied in night |
| 4. Summer | (d) Provide drinking water |
| 5. Waterer | (e) Preparation of concentrate mixture |

NOTES

E. Crossword

¹ W		²	H			G	
		U					
		M					
³ C			A			N	G
⁴ S		R		W			

Across

1. Process of cleaning of shed by flushing of water
3. It is done regularly within the shed to make the animal healthy
4. Type of dry fodder offered to the animals

Down

2. During this season water requirement of the animal increases

GLOSSARY

Concentrate: Feeds that are generally high in energy, low in fibre, and are usually highly digestible.

Feed/Feedstuff: Food for livestock.

Fodder: Plants or parts of the plant eaten by livestock. A plant purposely grown for livestock feeding.

Fumigation: The method of killing insects and pests of a godown by the release of gaseous pesticides or fumigants.

Rancidity: When feed becomes spoilt and unsafe for animal consumption.

Ration: It is the feed allowed for a given animal during a day of 24 hours. The feed may be given at a time or in portion at intervals.

Records: Information or data collected and preserved on a particular subject.



ANSWERS

Unit 1: Introduction to Dairy Farming

Session 1: Dairy Farming in India

A. Multiple choice questions

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

B. Fill in the blanks

1. 337 grams
2. 3
3. employment generation

C. Mark true or false

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

Session 2: Important Breeds of Cattle

A. Multiple choice questions

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

B. Fill in the blanks

1. Crossbred
2. Jaffarabadi
3. Kerala
4. Surti or Chilika
5. *Bos taurus*

C. Mark true or false

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

D. Match the following

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

E. Crossword

Across

1. Murrah

Up and down

2. Hump

3. Thigh
4. Surti
5. Jersey
6. Muzzle

Unit 2: Livestock Accommodation

Session 1: Basics of Animal Housing

A. Multiple choice questions

1. (c) 2. (b) 3. (d) 4. (b) 5. (d)

B. Fill in the blanks

1. Covered
2. 5 feet
3. 10
4. 30 feet
5. Castration

C. Mark true or false

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

D. Match the following

1. (b) 2. (c) 3. (d) 4. (e) 5. (a)

E. Crossword

Across

1. Manger

Down

1. Manure
2. Paddock
3. Bedding
4. Road

Session 2: Housing Layout for Dairy Animals

A. Multiple choice questions

1. (c) 2. (b) 3. (c) 4. (a) 5. (d)

B. Fill in the blanks

1. Slurry
2. 8
3. 4–5
4. 5
5. 40



C. Mark true or false

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

D. Match the following

1. (e) 2. (a) 3. (b) 4. (c) 5. (d)

E. Crossword

Across

3. Calving
4. Silo
5. Hose

Down

1. Bullock
2. Pen

Unit 3: Establishing Livestock within Accommodation

Session 1: Standard Practices for Maintaining Health of Cattle

A. Multiple choice questions

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

B. Fill in the blanks

1. Ramp
2. On foot
3. 20 degrees
4. Social
5. Annually

C. Mark true or false

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

D. Match the following

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

E. Crossword

Across

1. Truck
2. Road
3. Rail

Down

4. Ramp

Session 2: Safety Measures for Farm Workers and Disposal of Manure

A. Multiple choice questions

1. (d) 2. (c) 3. (d) 4. (d) 5. (d)

B. Fill in the blanks

1. Personal protective equipment
2. 100
3. Two
4. Earthworms
5. Blue

C. Mark true or false

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

D. Match the following

1. (d) 2. (e) 3. (a) 4. (b) 5. (c)

Unit 4: Providing Feed and Water for Livestock

Session 1: Animal feedstuff, their Characteristics, Composition and Quality

A. Multiple choice questions

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

B. Fill in the blanks

1. 70
2. 40
3. 2.25
4. 2.25
5. 16

C. Mark true or false

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

D. Match the following

1. (c) 2. (d) 3. (e) 4. (a) 5. (b)

E. Crossword

Across

4. Maize
5. TDN



Down

1. Hay
2. Lignin
3. Berseem

Session 2: Feeding of Dairy Animals**A. Multiple choice questions**

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

B. Fill in the blanks

1. Roughage/Fodder
2. Maintenance ration
3. Dry matter
4. Additives
5. 0.5

C. Mark true or false

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

D. Match the following

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

E. Crossword**Across**

5. Draft

Down

1. Mustard
2. Soybean
3. Growth
4. Fodder

Session 3: Preparation of Animal Feed**A. Multiple choice questions**

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

B. Fill in the blanks

1. Feed grinder
2. Concentrate
3. 12
4. Rainy
5. Rodents and insects

C. Mark true or false

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

D. Match the following

1. (c) 2. (d) 3. (a) 4. (b) 5. (e)

E. Crossword

Across

1. Grinder
2. Drum
4. Silo

Down

1. Godown
3. Mixer

Session 4: Maintaining Feed and Water Supply

A. Multiple choice questions

1. (b) 2. (a) 3. (d) 4. (d) 5. (d)

B. Fill in the blanks

1. 130
2. 14
3. 3
4. 8–10

C. Mark true or false

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

D. Match the following

1. (e) 2. (a) 3. (b) 4. (c) 5. (d)

E. Crossword

Across

1. Washing
3. Cleaning
4. Straw

Down

2. Summer



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Unit 2

Fig. 2.15	Bureau of Indian Standards
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