

Dairy Farmer–II

(Job Role)

Qualification Pack: Ref. Id. Agr/Q4101
Sector: Agriculture

Textbook for Class XII



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एन सी ई आर टी
NCERT

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FOREWORD

The National Curriculum Framework (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 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 the society. Work involves interaction with material or other people (mostly both), thus, creating a deeper comprehension and increased practical knowledge of natural substances and social relationships.

Through work and education, school knowledge can be easily linked to learners' life outside the school. This also makes a departure from the legacy of bookish learning and bridges the gap between school, home, community and 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, the 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 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 (NOSs) for the job role and to promote experiential learning related to the vocation. This will enable the students to acquire necessary skills, knowledge and attitude.

I acknowledge the contribution of the book development team, reviewers and all 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.

New Delhi
June 2018

HRUSHIKESH SENAPATY
Director
National Council of Educational
Research and Training

ABOUT THE TEXTBOOK

A Dairy Farmer is responsible for profitably managing various activities in a dairy farm like production and marketing of milk and milk products, and maintaining the health and productivity of cattle. The person is expected to demonstrate the ability to make various strategic and operational decisions in the dairy farm. 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 various methods of production to meet the demands of customers and processors. The textbook throws an insight into how these objectives can be achieved.

Dairy animals do not include goats as the share of goat milk in the total milk production in India is only 3–4 per cent. Therefore, this textbook focuses only on cows and buffaloes, who are the main contributors in the country's total milk produce.

The textbook is written to impart practical know-how to students desirous of making a career in the milk production business. It focuses on the relationship between consumer safety, and economic, social and environmental management at farm level. It contains guidelines and practices required to contribute to profitable dairy farming. The various practices cover key aspects of animal health—nutrition, milk hygiene and environment welfare.

The practices recommended in the textbook have been drawn from practical experiences at Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh. The students are encouraged to select and implement guidelines relevant to their situation. Hence, the textbook aims to provide a framework for dairying schemes to be developed nationwide by providing entrepreneurs and dairy farmers with an opportunity to develop dairy farming practices specific to their needs.

The textbook has been developed with the contribution of subject and industry experts. Adequate care has been taken to align the content of the textbook with the National Occupational Standards (NOSs) for the job role of a Dairy Farmer. This will enable the students to acquire knowledge and skills as per the performance criteria mentioned in the Qualification Pack by the Agriculture Skill Council

of India. The textbook has been reviewed by an expert faculty of the Indian Veterinary Research Institute, Izatnagar, Uttar Pradesh, to ensure that the content is not only aligned with the NOSs but is also of high quality. The NOSs for the job role of Dairy Farmer covered in the textbook are as follows.

1. AGR/N4106: Forage conservation
2. AGR/N4104: Maintaining healthy performance of livestock
3. AGR/N4105: Performing hand and machine milking
4. AGR/N9903: Maintaining health and safety standards
at workplace
5. AGR/N4107: Entrepreneurship

The textbook is divided into five Units. Unit 1 talks about fodder crops, their harvesting and methods of forage conservation. Unit 2 describes the ways and means of maintaining healthy performance of livestock. The different methods of performing hand and machine milking are detailed in Unit 3. Unit 4 contains information on how to maintain the health and safety of animals in a dairy farm. Unit 5 discusses the important aspects of entrepreneurship in the dairy sector.

We hope this textbook will be useful for teachers and students, who opt for this job role. Suggestions for improving the textbook are welcome.

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The contributions of our colleagues at the Department of Curriculum Studies (DCS), NCERT, and members of the textbook review team — Saroj Yadav, *Professor and Dean (Academic)*, NCERT, and Anita Nuna, *Professor and Head*, DCS, are duly acknowledged. We also thank Ranjana Arora, *Professor and In-charge*, Curriculum Group, for reviewing the textbook and giving valuable suggestions for its improvement.

Gyanendra Kumar Gaur, *Professor*; S. K. Mendiratta, *Professor* and Geeta Chauhan, *Associate Professor*, Indian Veterinary Research Institute, Izatnagar, Uttar Pradesh, are appreciated for reviewing the textbook.

The council acknowledges P. D. Juyal, *Vice Chancellor*, Nanaji Deshmukh Veterinary Science University (NDVSU), Jabalpur, for providing constant encouragement and support during the preparation of the textbook, and Biswajit Roy, *Associate Professor*, Department of Livestock Production Management, NDVSU, for providing photographs of animals and preparing other visuals included in the textbook.

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

Gratitude is also due to the Publication Division, NCERT, for transforming the manuscript into an attractive textbook. Special thanks are due to Sweta Jha, *Editor* (contractual) and Seema Kumar, *freelance editor*, for copyediting this textbook. Pavan Kumar Barriar, *DTP Operator*, Publication Division, and Sachin Tanwar, *DTP Operator* (contractual), are appreciated for layout and design.

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Unit

1



Conservation of Forages

INTRODUCTION

Feed alone constitute about 70 per cent of the total animal production cost. Fodder crops are the essential and cheapest source of feed for ruminants. Therefore, feeding strategies aimed at improving milk production in cows and buffaloes can be based on the selection of fodder crops, which is important to reduce the cost of animal production. Land availability for the cultivation of fodder crops is decreasing day-by-day. As a result, there is tremendous pressure of livestock on the available feed and fodder. Intensive fodder production and judicious use of fodder support animal productivity. To excel in dairy farming, an entrepreneur needs to pay attention to fodder cultivation and conservation of forages.

SESSION 1: FODDER CROPS AND THEIR HARVESTING

Fodder include crops and pasture species that are grown, harvested and processed to be used as feed for farm animals. Fodder is either directly



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Fig. 1.1: Fodder crop (napier grass) at Indian Veterinary Research Institute (IVRI), Izatnagar

fed to the animals or preserved for future use as feed. Fodder crops are plants that are grown to yield high biomass. These are rich in nutrients. Feeding fodder crops keeps an animal healthy and adds to its productivity. Natural pasture is forage but is not grown as a crop.

The Indian Grassland and Fodder Research Institute (IGFRI), Jhansi, is a premier institute for forage resource development in Asia. The Institute has developed several technologies for maximising fodder yield and fodder seed production in different agro-climatic conditions, and under various crop rotations. Fodder production technologies have been developed to meet the requirement of feed for dairy animals, especially, during lean periods. The IGFRI has developed and popularised various post-harvest technologies and machines for fodder cultivation.

Fodder crops on the basis of season

In India, agricultural crop production seasons are divided into *Kharif*, *Rabi* and *Zaid*. Fig. 1.2 illustrates the major fodder crops cultivated during these seasons.

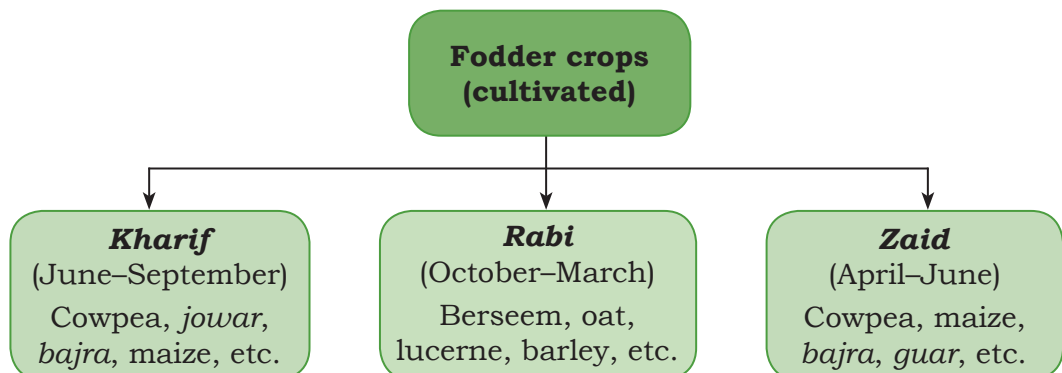


Fig. 1.2: Classification of fodder crops on the basis of seasons

Fodder crops on the basis of protein content

Fodder crops are broadly divided into leguminous (containing high protein content) and non-leguminous (containing average protein content) as shown in Fig. 1.3. Fresh common leguminous fodder crops like berseem, lucerne and cowpea contain an average protein content



of 2–2.5 per cent, whereas, fresh non-leguminous fodder crops like maize, *jowar*, *bajra*, oat, etc., contain an average protein content of 0.7–1.5 per cent.

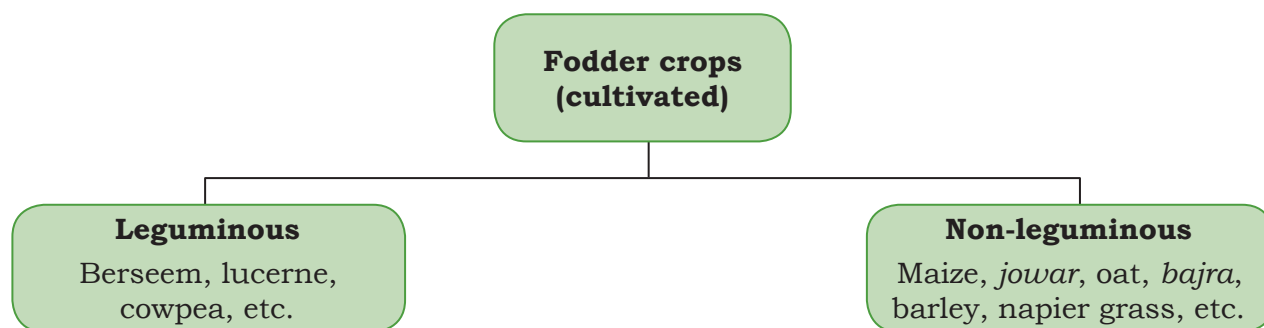


Fig. 1.3: Classification of fodder crops on the basis of protein content

Common fodder crops grown in India

To grow different type of fodder crops on a farm, a dairy farmer takes into account per hectare yield of the various fodder crops being grown there. Table 1.1 shows a combination of various leguminous and non-leguminous fodder crops that may be grown by the dairy farmer.

Table 1.1: Common leguminous and non-leguminous fodder crops grown in India in different seasons

Season	Fodder crops	Yield (quintal/ hectare)
Kharif	Non-leguminous	
	Maize (<i>Zea mays</i>)	350–450
	Sorghum (<i>Sorghum bicolor</i>)	650–1050
	Hybrid napier (<i>Pennisetum perpureum</i>)	1200–1500
	Leguminous	
	Cowpea (<i>Vigna sinensis</i>)	300–350
Rabi	Non-leguminous	
	Oat (<i>Avena sativa</i>)	400–450
	Barley (<i>Hordeum vulgare</i>)	400–450
	Leguminous	
	Berseem (<i>Trifolium alexandrinum</i>)	750–800
	Lucerne (<i>Medicago sativa</i>)	800–1000



Zaid	Non-leguminous	
	Maize (<i>Zea mays</i>)	350–450
	Sorghum (<i>Sorghum bicolor</i>)	650–1050
	Hybrid napier (<i>Pennisetum purpureum</i>)	1200–1500
	Para grass (<i>Brachiaria multica</i>)	750
	Leguminous	
	Cowpea (<i>Vigna sinensis</i>)	300–350
	Lucerne (<i>Medicago sativa</i>)	800–1000



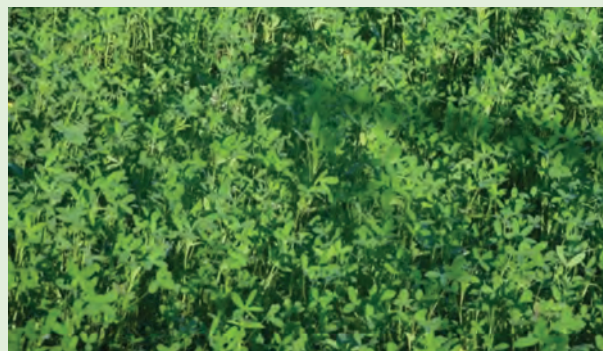
(a) Sorghum or Jowar



(b) Maize



(c) Oat



(d) Berseem



(e) Para grass



(f) Guinea grass

Fig. 1.4(a-f): Some common fodder crops grown in India



Harvesting of fodder crops

It means cutting and removing fodder crops from a field. Fodder crops are harvested at a particular stage of growth to optimise quantity and quality of green biomass. Harvesting fodder crops at a young stage may result in higher protein content but decreased biomass yield. On the other hand, as a plant matures, the protein content rapidly decreases. Especially at the beginning of a fodder plant's flowering stage, the protein content in the leaves and stems is drastically reduced but the total biomass yield increases. Some forage crops like sorghum are not harvested at an early stage because of the presence of anti-nutritional factors, such as *dhurrin* (a cyanogenic glycoside in plants).

Purpose of harvesting

Forages are fed to farm animals as pasture in green chopped form, silage or hay. If the animals are allowed to graze on pasture lands, most of the forage growing in that area will be trampled, contaminated with dung and urine, and hence, wasted. Chopped green fodder is similar to intensive grazing as far as bio-availability of nutrients to animals is concerned. Though harvesting and green chopping of fodder crops involve additional costs (equipment, energy and labour costs), there are definite savings in the form of reduced wastage of fodder as there is no trampling in the pastures by the animals. Besides, the animals can be fed with tree leaves as green fodder during times of scarcity. Therefore, leaves can also be harvested and stored. Chopped green fodder ready to be fed to the animals is shown in Fig. 1.5.

Loss of biomass and nutrients caused during hay and silage making occurs during harvesting and



Fig. 1.5: Chopped green fodder for animals

NOTES

storage stage. Harvest and storage losses are the highest in silage and haymaking. However, these losses can be minimised if hay and silage making practices are followed strategically. Harvesting serves the following purposes.

- Provides green fodder to the animals
- Provides optimum nutrients to the animals
- Facilitates increased biomass yield from a field
- Stores excess fodder in the form of hay, silage, etc., for use during lean period
- Maintains desired plant species in pasture

Methods of harvesting

Harvesting is, usually, carried out by either of the following methods.

Manual

Sickle is the most common tool used for harvesting fodder crops. It must be sharp, curved and serrated. Other traditionally designed tools are also used for harvesting and cutting of crops or tougher portions of plants in different parts of the country.

Mechanical

In this method, harvesting is done with the use of implements or machines, such as tractor attached fodder cutter.

Harvesting time

All fodder crops change in nutritive profile as they mature. Fodder crops at very early stages of growth have high protein content and are, usually, easily digestible but their yield (total volume or biomass) is low. As a plant grows, the yield increases but digestibility and protein content decrease. The stage of harvesting determines the herbage yield and quality in all fodder crops. A balance between yield and quality, therefore, needs to be assessed for harvesting of crops. The harvesting time of major fodder crops is shown in Table 1.2.



Table 1.2: Harvesting time of major fodder crops

Fodder crop	Growth stage and time of harvesting
<i>Jowar</i>	<p>Single-cut varieties: Harvesting is done immediately after flowering to 50 per cent flowering stage of a plant.</p> <p>Multi-cut varieties: The first cutting must be done when the plant is two months old and subsequent cuts at an interval of 35–40 days.</p>
Maize	<p>The usual harvesting time is 60–70 days after sowing when plants are in the ‘milk stage’. At this stage, the seed head is green and the developing grain contains milky starch.</p> <p>As green fodder: Harvesting must start at the ‘cob formation stage’ and be completed before the milk stage.</p> <p>For silage preparation: Harvesting must be done when the cobs are soft or glazed with high energy content.</p>
<i>Bajra</i>	<p>The usual harvesting time is the ‘boot leaf stage’ or immediately after flowering in case of few plants.</p> <p>In case of multi-cut varieties, subsequent cuttings can be made at an interval of 30–40 days.</p>
Oat	<p>When oat is cultivated as a single crop, harvesting must be done at the initiation of flowering to 50 per cent bloom stage. However, in mixed cropping, both the crops need to be cultivated jointly once they attain maturity. The first cutting must be made 60–70 days after sowing.</p>
Cowpea	<p>Single-cut varieties: Harvesting must be done 70–90 days after sowing.</p> <p>Double-cut varieties: The first cut needs to be made 50–55 days after sowing or when the crop has grown 15 cm above the ground level. The second cut is made 45–50 days after the first cutting.</p> <p>Three-cut varieties: The first cut must be made 45–50 days after sowing and subsequent two cuttings after every 25–30 days.</p>
Berseem	<p>The first cut must be made at 45–50 days of sowing, while the subsequent cuts be made at an interval of 20–25 days. In all, four to five cuttings may be obtained.</p>
Lucerne	<p>The first cut is made 45–60 days after sowing. Subsequent cuts are made at an interval of 20–30 days. The crop can be retained for three to four years in the same field.</p>



NOTES

Hybrid napier grass	The first cut is made 9–10 weeks after planting. Subsequent cuts are made after four to six weeks or when the plant attains a height of 1.5 metre. Annually, at least six to eight cuts need to be made.
Para grass	The first harvest takes about three months after planting when the grass attains a height of about 60–75 cm. Subsequent cuts are made at an interval of 30–40 days.

Practical Exercise

Activity

Prepare a herbarium sheet of seasonal fodder crops and write their nutritive value in terms of protein content.

Material required: herbarium sheet, leaves of different fodder crops, double-sided tape or glue and writing material

Procedure

- Collect leaves of different seasonal fodder crops from the school campus and surrounding areas.
- Paste four to five different leaves on a single herbarium sheet, label them and mention their protein percentage.
- Discuss it in class.

Check Your Progress

A. Multiple Choice Questions

1. The Indian Grassland and Fodder Research Institute is located in _____.
(a) New Delhi (b) Kolkata
(c) Jhansi (d) Bareilly
2. _____ is a *Kharif* fodder.
(a) Berseem (b) Maize
(c) Barley (d) Oat
3. _____ is considered as a *Rabi* fodder.
(a) Berseem (b) Maize
(c) Cowpea (d) Sorghum
4. _____ is a leguminous fodder.
(a) Sorghum (b) Mustard
(c) Lucerne (d) Maize
5. Which of these purposes does harvesting of fodder serve?
(a) Provides optimum nutrients to animals
(b) Facilitates increased biomass yield from a field
(c) Provides green fodder to animals
(d) All of the above



B. Fill in the Blanks

1. The scientific name of sorghum is _____.
2. Sorghum must not be harvested at an early stage because of the presence of anti-nutritional factors like _____.
3. The usual harvesting time for maize is _____ days after sowing when the plants are in the milk stage.
4. The scientific name of lucerne is _____.
5. _____ is a leguminous fodder grown in the *Kharif* season.

C. Mark 'True' or 'False'

1. Fodder crops are the essential and cheapest source of feed for ruminants.
2. Leguminous fodder crops contain high protein content.
3. As a plant grows, biomass yield increases.
4. Year-round fodder production facilitates storage of fodder.
5. As a plant matures, its protein content decreases rapidly.

D. Match the Columns

- | A | B |
|------------|-----------------------------------|
| 1. Berseem | (a) <i>Vigna sinensis</i> |
| 2. Lucerne | (b) <i>Sorghum bicolor</i> |
| 3. Cowpea | (c) <i>Hordeum vulgare</i> |
| 4. Sorghum | (d) <i>Trifolium alexandrinum</i> |
| 5. Barley | (e) <i>Medicago sativa</i> |

E. Crossword

		¹ R		² B			
		³ K	H			I	F
	⁴ B	A		R			
⁵ C		W			A		
				Y			
	T						

Across

1. Fodder crop is cultivated in winter season.
3. Fodder crop is cultivated in rainy season.
4. Scientific name of the fodder is *Pennisetum typhoides*.
5. Leguminous fodder crop in *Kharif* season.

Down

2. Non-leguminous fodder grown in the *Rabi* season.



SESSION 2: METHODS OF CONSERVATION OF FORAGES AND ASSESSING THEIR QUALITY

Conservation of forages

Fodder is the primary feed for all ruminants (cow, buffalo, sheep, goat, etc.). But it is not regularly and sufficiently available through the year. In India, during the rainy season, plenty of greens are available but they are not effectively utilised by farmers due to lack of knowledge about fodder conservation. The surplus fodder can be conserved in the form of hay and silage during periods of excess availability. By adopting hay and silage making techniques, quality fodder can be availed during lean periods (May to July and October to November) as well. The conserved fodder can be used either for consumption at a dairy farm or sold to farmers. During natural calamities like flood, draught, etc., this fodder serves as feed for farm animals, including dairy animals, providing them with the required nutrients.

Conditions for forage conservation

The various conditions required for the conservation of forages are depicted in Fig. 1.6.

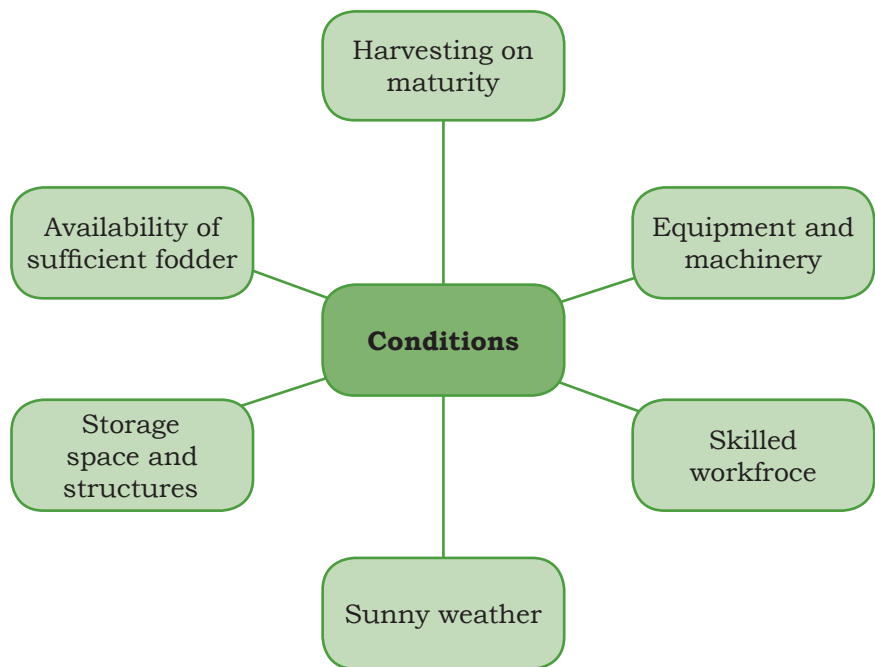


Fig. 1.6: Conditions required for forage conservation



Tools and equipment for forage conservation

The various tools and equipment required for conservation of forages are given in Table 1.3. These tools and equipment must meet the necessary occupational health and safety standards.

Table 1.3: Tools and equipment required for forage conservation, and their functions

Tools and equipment	Functions
Mower	It is a machine used to cut fodder crops and leave them in a swath (a row of cut crops during single passage of a mowing machine).
Sickle	It is a tool used in manual harvesting of fodder crops. It consists of a metallic blade (plain or serrated) and a wooden handle.
Wooden or metal forks	This tool is required for turning, tedding, loading and stacking fodder.
Tractor with trolley	It is a machine used in transportation of fodder.
Chaff cutter	It is a tool used to chaff fodder into small pieces. Both manually and electrically operated chaff cutters are available in market.
Baler	It is a machine used to compress and compact hay into bales. The baler is attached to a tractor.
Electrically operated chaff cutter	It is a machine used in uniform chopping of fodder for livestock. Chaff cutters available in market are equipped with electric motor, pulley and belt.



(a) Mower



(b) Sickle



(c) Tractor with trolley



(d) Electrically operated chaff cutter



(e) Different type of electrically operated chaff cutter

Fig. 1.7 (a-e): Tools and equipment used for forage conservation

Methods of forage conservation

Some of the commonly practised forage conservation methods are as follows.

Hay

Hay is obtained when forage crops are preserved by reducing their moisture content from about 85 to 15–20 per cent. Fodder crops with hollow stems are most suitable for haymaking. The process of haymaking turns green and perishable forage into a product that can be safely stored and easily transported without getting spoilt. The nutritive value of forage determines the nutritional profile of hay. The maintenance requirement for dairy animals can be met solely by feeding quality hay to them. Maintenance, here, implies maintaining the health and growth of the animals.

Steps for haymaking

Mowing or cutting: The fodder must be harvested at the stage of maturity, which is a major factor in determining the quality of hay. But herbage quality drops rapidly with increasing maturity, especially, after flowering. Therefore, young leafy grass is less easy to handle than mature herbage. However, the yield of the former is less. A compromise between yield and quality has to be made, and usually, cutting at early to mid-flowering stage will give a reasonable product.

Curing: This is the process of drying the fodder to reach the appropriate moisture content of about 15–20 per cent. Curing starts in the field after cutting, when the material is left to wilt. The 'wilting period' varies with the type of material and weather conditions. The various methods of drying practised in haymaking are as follows.

- (a) **Artificial conditioning:** It refers to rapid drying of fodder crops with machines and fans.



- (b) Turning and tedding: It allows uniform drying of swath, helps dissipate heat, and reduces the danger of mould development and fermentation.
- (c) Windrowing: It refers to the process of putting the cut herbage in rows for further handling and collection, and for protection at night. In hot arid conditions, windrowing protects the crop against shattering and bleaching.
- (d) Trussing: It includes making small heaps during intermediate stages of drying and is largely practised in manual systems of forage conservation.

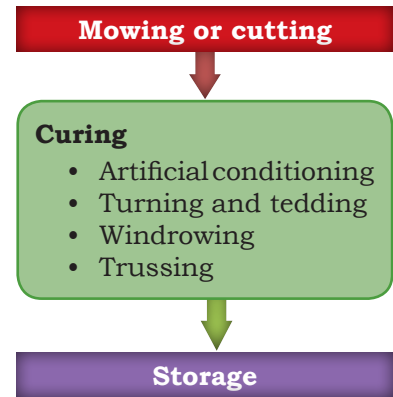


Fig. 1.8: Steps involved in haymaking

Storage: Hay can be kept for long periods, if it contains moisture up to 15–20 per cent. Hay is, generally, stored loose, baled or chopped.

Silage

Silage is obtained by fermentation of forages under anaerobic conditions. The process of conserving green fodder in this way is known as ‘ensiling’. The container, in which the material is fermented, is called a ‘silo’. The structure of a bunker-type silo is shown in Fig. 1.9(a). Silage is also called ‘pickled grass’. Silage is wet forage with about 70 per cent moisture content. Fodder crops having thick stems are suitable for silage making. The steps involved in silage making are shown in Fig. 1.10.



Fig. 1.9(a): Structure of bunker-type silo



Fig. 1.9(b): Silage pit

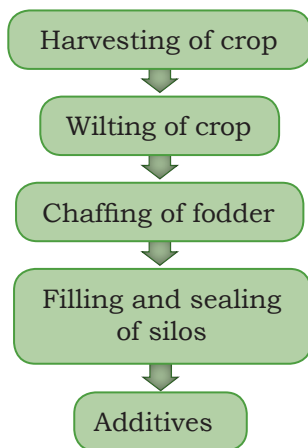


Fig. 1.10: Steps involved in silage making

Steps for silage making

Harvesting of crop: A fodder crop must be harvested when its stems are thick and they have about 70 per cent moisture content.

Wilting of crop: The green fodder must have about 30 per cent dry content. This is achieved by allowing wilting for a certain period.

Chaffing of fodder: The fodder must be chaffed into small pieces, preferably 2–3 cm, either with the help of a manually operated chaff cutter or power-driven chaff cutter.

Filling and sealing of silos: The silos must be filled within 3–4 days and the material must be compacted to prevent the entry of outside air. Preventing the entry of outside air is called ‘sealing’, which must be for a minimum of 60–70 days, after which the silage is ready to be used as animal feed.

Additives: Depending upon the type of fodder crop, additives like urea, mollasses, etc., can be added to the chaffed fodder to improve the nutrient value of the silage.

Straw and agricultural waste

After harvesting the grain crops, the remaining plant parts can be used as dry fodder for animals. Straws and other agriculture waste are preserved for a long duration without much effort. Straws can be easily stored in hay or straw godown and fed to the animals (Fig. 1.11).



Fig. 1.11: Godown for storing straw (bhusa)

Assessing the quality of conserved forage

Hay

The quality of hay is judged on the basis of the following characteristics.

- If the hay is yellow or green in colour, it is of good quality.
- If the hay is yellow or grey in colour, it is of average quality.



- If the colour is brown or black, then the hay is of poor quality.
- The hay must be checked for the presence of mould, dust and foul smell.
- It must also be checked for the presence of weeds, thorns, etc.

Silage

Silage quality is, usually, judged on the basis of the following characteristics.

- Smell (Butyric acid)
- Colour (quality silage is greenish yellow in colour)
- Wetness and structure
- Soil contamination

Ways to minimise environmental impact

Forage debris can attract vermin and cause losses to the stored hay. Therefore, safe and appropriate disposal of waste and debris generated from feed storage is essential to minimise harmful environmental impacts. The following points must be considered to minimise harmful effects to the environment.

- Surroundings around the storage structure must be cleaned regularly.
- The stored feed material must be checked regularly to avoid spoilage.
- Chemicals must not be used for artificial curing of hay as they may have a harmful impact on the environment.
- Routine cleaning and servicing of machinery and equipment must be carried out in accordance with the manufacturer's specifications.
- Effluents are generated from conserved forage structures, such as silos. Therefore, suitable arrangements for run-offs must be made in an effluent treatment plant.



Assessing the requirement of conserved fodder

The total amount of fodder (in tons) required for a particular farm depends on a number of factors. Some of the factors that influence the fodder requirement of a dairy farm are shown in Fig. 1.12.

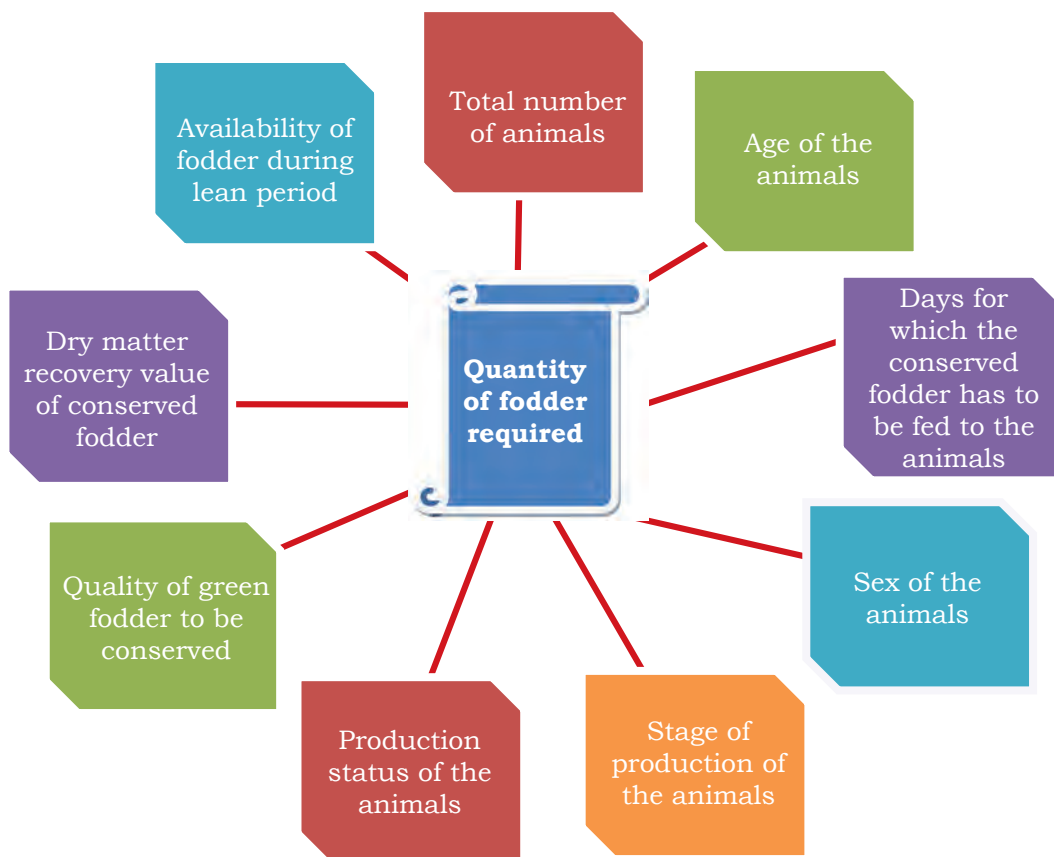


Fig. 1.12: Factors influencing fodder requirement in a dairy farm

As a thumb rule, a cow can consume 20–25 kg of silage per day. For a unit of 10 cows, approximately 240 quintal of silage is required during fodder scarcity period, i.e., four months ($10 \text{ animals} \times 20 \text{ kg per day} \times 120 \text{ days} = 240 \text{ quintal}$). Similarly, adult animals consume about 5–6 kg hay per day, besides other feeds. For a unit of 10 cows, approximately 72 quintal of hay is required during the fodder scarcity period, i.e., four months ($10 \text{ animals} \times 6 \text{ kg per day} \times 120 \text{ days} = 72 \text{ quintal}$).



Practical Exercise

Activity

Demonstrate the process of haymaking.

Material required: sickle, wood or metal fork, tractor and writing material

Procedure

- Mowing or cutting: Harvest the fodder to be used for haymaking.
- Curing: Dry the fodder to attain appropriate moisture content at about 15 to 20 per cent.
- Storage: Hay must be stored loose, baled or chopped.

Check Your Progress

A. Multiple Choice Questions

1. Dry matter content of silage must preferably be _____ per cent.
(a) 10 (b) 15
(c) 20 (d) 30
2. Fodder is not the primary feed for which animal?
(a) Cow (b) Buffalo
(c) Pig (d) Goat
3. _____ is also known as 'pickled grass'.
(a) Hay (b) Silage
(c) Dry fodder (d) None of the above
4. The smell of good quality silage is due to the presence of _____.
(a) Butyric acid (b) Acetic acid
(c) Propionic acid (d) None of the above
5. _____ is not, generally, required for conservation of forages.
(a) Sickle (b) Baler
(c) Chaff cutter (d) Rotavator

B. Fill in the Blanks

1. _____ stem crops are suitable for haymaking.
2. Dry matter content of stored hay preferably needs to be about _____ per cent.
3. After _____ days of sealing of silo, silage will be ready to feed animals.
4. Good quality silage is _____ in colour.
5. Good quality hay is _____ or in colour.

NOTES



NOTES

C. Mark 'True' or 'False'

1. Hollow stem crops are suitable for silage making.
2. Silage is prepared under aerobic conditions.
3. A baler is used to prepare hay.
4. Fire hazard is a problem of silage.
5. Brown or black colour hay indicates it is of poor quality.

D. Match the Columns

- | A | B |
|--------------------------|--|
| 1. Mower | (a) For turning, tedding, loading and stacking of fodder |
| 2. Wooden or metal forks | (b) Transportation of fodder |
| 3. Tractor | (c) To compress and compact hay into bales |
| 4. Baler | (d) To chaff fodder into small pieces |
| 5. Chaff cutter | (e) To cut fodder and leave them in a swath |

E. Crossword

		¹ B	A	L	E	
	² C	U	R		N	G
		T				
		Y				
	³ G		E		N	
		I				
⁴ S	I			L	E	

Across

1. Hay can be stored in this form.
2. This is the process of drying fodder up to appropriate moisture content of about 15 to 20 per cent for haymaking.
3. This is the colour of good quality silage.
4. It is a simple harvesting tool used manually and consists of metallic blade (plain or serrated) and a wooden handle.

Down

1. Smell of good quality silage is due to this acid.



Unit

2



Maintaining Healthy Performance of Livestock

INTRODUCTION

Maintaining the health of animals is important for optimum livestock productivity. Like human beings, animals are also susceptible to diseases. Diseases affect the productivity of dairy animals through lowered milk yield, reduced fertility, delayed maturity, reduced feed conversion ratio, etc. This Unit discusses the signs of health, well-being and maintenance of animals, and management practices that need to be followed to maintain animal productivity.

SESSION 1: MAINTAINING THE WELL-BEING OF DAIRY ANIMALS

Signs of a healthy animal

A healthy animal is active, alert and aware of its surroundings. It has a steady gait, walks on all four feet and does not limp. In case of mild or moderate infection, though the animal will stand on all four feet, it will look dull, depressed and lethargic. There will be discomfort and reluctance in its walking. But in case of severe infection or disease, the animal will lie on the ground for the maximum number of hours and will limp while walking. If the animal stays away from other animals in a herd, it indicates that it is having some health problem. A sick animal is not interested in its surroundings and does not want to move.



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Table 2.1: Difference between healthy and sick animal

Healthy animal	Sick animal
Alert	Lethargic and listless
Chews cud	Does not chew cud
Sleek coat	Rough coat
Bright eyes and pink eye membrane	Dull, sunken, and sometimes, watery eyes
Normal faeces and urine	Abnormal faeces and discoloured urine
Normal temperature	High temperature
Steady gait and no limping	Limping
Normal respiration	Laboured breathing or coughing
Stays in herd or flock	Separates self from herd
Eats and drinks normally	Loss of appetite
Normal pulse rate	Abnormal pulse rate



Fig. 2.1(a): Healthy Sahiwal cow



Fig. 2.1(b): Sick Sahiwal cow



Fig. 2.2(a): Healthy Murrah buffalo



Fig. 2.2(b): Sick Murrah buffalo



Animal freedom

Freedom is the basic need of every animal. The various types of animal freedom are as follows.

Freedom for hunger and thirst

It means the animals have access to drinking water and fodder, which are necessary for their health and vigour.

Freedom from discomfort

It means providing a suitable environment, such as shelter and comfortable resting area to the animals.

Freedom from pain, injury or diseases

It relates to treating diseases and injuries in animals, and preventing their occurrence. It also refers to frequent diagnosis and checkups.

Freedom to express normal behaviour

The animals must be provided with adequate care and sheltered in a conducive environment, so that they can behave normally. This entails providing sufficient space for animal movement, ensuring adequate facilities to them and keeping them with other animals of same type.

Freedom from fear and distress

It means the animals must not be subjected to any sort of mental trauma like fear, loneliness, anxiety, etc., and physical suffering like hunger, illness or pain due to sickness or injury, etc. It must be ensured that the animals get the following five basic freedoms.

- To move around
- To groom themselves
- To get up
- To lie down
- To stretch their limbs

Grooming

In natural environment, cows and buffaloes use trees and other abrasive surfaces to scratch and groom themselves. They rub their bodies against walls or other fixed objects in the barn to groom themselves.



Animal welfare

This relates to an animal's health and well-being, and reflects the quality of the life it lives. The evaluation for animal welfare must consider scientific evidence available, concerning their behaviour and functions. Animal welfare refers to how an animal copes mentally and physically with the conditions where it lives. Various signs, which indicate that an animal is healthy, are its life span, less susceptibility to diseases, display of normal behaviour and reproduction. Public concerns about animal welfare are based on various steps being taken for maximising their well-being.

Animal welfare regulations

The Constitution of India emphasises on the protection of animals. According to Article 51A(g) of the Constitution, it is the duty of every citizen of the country to protect and improve the natural environment, including forests, lakes, rivers and wildlife, and have compassion for living creatures. Besides, India is one of the first countries to enact a law forbidding animal cruelty, i.e., Prevention of Cruelty to Animals Act, 1960.

Regular monitoring of animals' health

Observe the animals daily to check for signs of poor health. These may include reduced feed or water intake, lethargy, watery or pale white mucoid discharge from the eyes, inflammation in the eyes and abnormal stool (colour and form). Regular monitoring of the animals' health helps identify, investigate and resolve their health and management problems. Animal health records provide accurate data as regards to diseases, injuries and infections. Careful observation and analysis of the animals' health record help identify their disease trends, review previous health issues, and determine the success rate of treatments and herd health programmes. Rather than self-evaluating the animals' health, it is better to maintain a herd health record as it provides accurate data about the health of all animals in a farm. The following points must be considered once sick animals are identified.



- Isolate the animals, suffering from diseases, in isolation sheds.
- There must be a separate staff to examine and take care of the animals kept in isolation. The staff, examining the animals, must wear protective clothing, boots, gloves and mask.
- Ensure that the staff wash their hands with an antiseptic soap when leaving the isolation area.
- Maintain a record of illness, treatment administered, behavioural changes observed in the animals and mortalities, if any.
- Intensify animal health monitoring during periods when there is an increased risk of diseases and infections.
- Adopt biosecurity measures to prevent the spread of infectious diseases in animals when unusual clinical signs or high mortality is observed.

Maintaining healthy and hygienic conditions

Healthy and hygienic conditions can be maintained by regularly supervising the dairy animals, cleaning their sheds, washing the animals and carrying out post-cleaning operations.

Supervision

- Daily, weekly and fortnightly schedules must be planned to supervise the animals.
- Labourers need to be given clear instructions as regards to animal supervision.
- Documentation must be done regularly.
- Every morning, all animals must be checked, counted and their behaviour be noted down.

Cleaning of sheds

- The floor of all sheds must be physically cleaned daily. Physical cleaning refers to the removal of urine, faecal and other organic material from the area.
- Detergent must be used while cleaning surfaces, and making them free of dirt and debris.



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- All mangers and water troughs must be cleaned daily.
- Sheds, where young calves and pregnant cows and buffaloes are housed, must be cleaned with a disinfectant regularly.
- Waste and soiled bedding need to be disposed in accordance with workplace rules.
- Any damage or maintenance work required must be reported to the supervisor immediately.
- Sick and injured animals need to be isolated, and their sheds be cleaned with a disinfectant.
- Old feed and fodder must be removed, and the troughs must be cleaned daily.
- The housing area must be made clean, safe, comfortable, and free from insect-pests and diseases.
- Entry of flies in the housing area must be controlled as they disturb the animals and adversely affect milk production.
- Clean housing area improves the health of dairy animals and quality of milk production.

Washing of animals

- The animals must be cleaned and washed periodically according to the weather conditions.
- Young calves need to be washed with lukewarm water daily.

Post-cleaning

- The bedding must be changed timely, especially, for young calves, and sick, injured and pregnant animals.
- Absorbent bed material can be used to give a dry feel to the animals.
- Clean equipment must be stored in their respective places.
- All clean grooming tools must be counted and stored.
- Damage to tools or equipment must be reported to the supervisor or concerned authority immediately.



Abnormal behaviour in dairy animals

It refers to a significant change in the behaviour of an animal, i.e., it can become aggressive and irritable, and may even stop eating or drinking. Display of abnormal behaviour in the animal may be indicative of illness, pain or discomfort. Some abnormal responses may be harmful, maladaptive or related to non-conducive environment. It cannot always be implied that an abnormal behaviour or response is necessarily a problem for the animal.

The term 'vice' refers to continued abnormal behaviour of animals in confinement, which causes economic losses to dairy farmers. Vices in animals may be due to various reasons, such as nervousness, mischief, aggression (viciousness) due to fear and exposure to stressful conditions like new handlers, food, environment, etc. Even during lactation period, when dairy animals feed their young ones, all these conditions can make them vicious, causing nutritional deficiencies and restlessness. Once established, vices are difficult to eliminate. Some vices lead to physiological problems, while others may be dangerous to the animals and their handlers, and may even cause destruction to life or property in a farm or field. Therefore, it is important to be able to identify and avoid situations, leading to the development of vices. Major vices in dairy animals are mismothering, nymphomania, wind sucking, kicking and masturbation (in case of bulls).

Mismothering

Cases of mismothering are common among cows and buffaloes. It may be due to a dam (mother) having suffered for a long period because of some chronic health condition or illness, difficult delivery and not being able to stand up for suckling. The calf may also be too weak to suckle.

Nymphomania

Both cows and buffaloes suffer from nymphomania. It is more common in cows than buffaloes. Nymphomania is mostly observed in high-yielding cows. A cow in heat



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for almost the entire day is called a 'nymphomaniac'. Such a cow behaves like a bull, pawing and mounting but refusing to stand for mounting by other cows. It could be an inherited trait.

Wind sucking

It is characterised by air sucked into the gastrointestinal tract and swallowing of excess air (aerophagia). Sometimes, it may be seen with head nodding, crib biting and tongue rolling. This vice is hereditary. It can be corrected by the application of a wind sucker strap or surgical creation of fistula.

Kicking

Sometimes, cows and buffaloes develop the habit of kicking. This may be due to discomfort or no training (breaking-in) given to a heifer prior to calving. If difficult to control, then a 'milkman's knot' or 'kicking trap' may be used as cows and buffaloes kick while being milked. To handle such an animal, its hind legs are tied with a rope in an eight-shaped knot. It is known as 'milkman's knot'.

Masturbation in bulls

It is common, especially, in bulls on a high protein diet. The behaviour can be modified by administering certain treatments, such as castration, spaying (sterilisation in case of female animals by removing the ovaries) and endocrine implants, which help increase production and enable easy handling.

Practical Exercise

Activity

Visit a nearby dairy farm and evaluate the health of cows based on the signs you observe in them.

Material required: writing material

Procedure

- Visit a nearby dairy farm and observe the cows sheltered there.
- Note down the abnormal physical signs you observe in the animals.



- Try to identify the health condition of the animals based on your observations.
- Make a report based on your observations and present it before the class.

Check Your Progress

A. Multiple Choice Questions

- The usual sign of a healthy animal is _____.
 - alertness
 - bright eyes and pink eye membrane
 - sleek coat
 - All of the above
- _____ is not an abnormal behaviour.

(a) Mismothering	(b) Suckling
(c) Nymphomania	(d) Kicking
- Vices may develop in dairy animals due to _____.
 - fear
 - nutritional deficiencies
 - nervousness
 - All of the above
- Vices _____.
 - cause physiological problems
 - are dangerous for the animal itself
 - are dangerous for the animal handler
 - All of the above
- _____ is not a sign of an unhealthy animal.

(a) Staying in herd	(b) Loss of appetite
(c) Rough coat	(d) Lethargic and listless

B. Fill in the Blanks

- Animal _____ describes how an animal is coping mentally and physically with the conditions where it lives.
- _____ is characterised by air sucked into the gastrointestinal tract and aerophagia.
- A cow that is in heat the entire day is _____.
- Masturbation in bulls can be corrected by _____.
- To check kicking habit, _____ or _____ may be used.

C. Mark 'True' or 'False'

- Wind sucking is hereditary.
- Nymphomania is common in low-yielding cows.

NOTES

3. Wind sucking can be corrected by the application of a wind sucker strap.
4. Clean housing improves the health of dairy animals and quality of milk production.
5. Masturbation is common in bulls on high protein diet.

D. Match the Columns

- | A | B |
|--------------------------------------|--------------------|
| 1. Wind sucking | (a) Sick animals |
| 2. Article 51A(g) | (b) Kicking |
| 3. Isolation shed | (c) Biosecurity |
| 4. Milkman's knot | (d) Aerophagia |
| 5. Prevention and spread of diseases | (e) Animal welfare |

E. Crossword

		³ A				
¹ F			E			M
		R				
		A	⁴ S			
	² V		C	E		
		A				

Across

1. It is the basic need of every farm animal.
2. It is a term that describes abnormal behaviour in animals.

Down

3. Wind sucking
4. This is a kind of animal, which is not interested in its surroundings and does not want to move, indicating health problems.



SESSION 2: PREVENTION AND CONTROL OF PARASITIC INFECTIONS

Parasites are organisms that live on or in a host organism and derive nutrients from it. There are two types of parasite — external (ectoparasite) and internal (endoparasite).

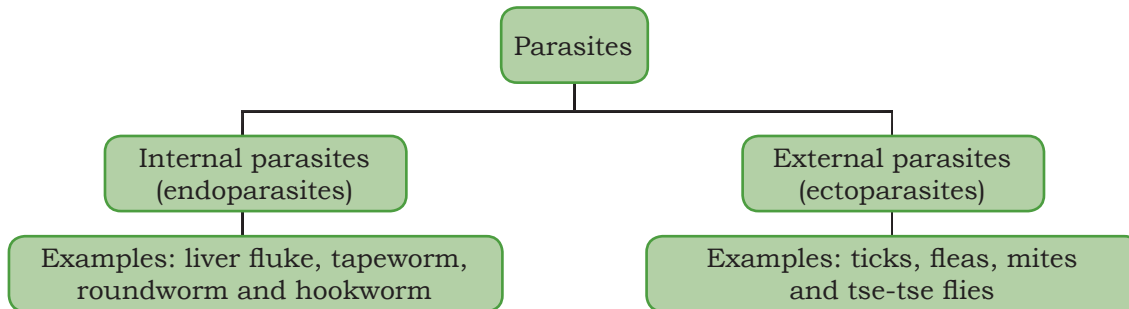


Fig. 2.3: Types of parasite

Parasites cause significant harm to farm animals by causing diseases and infections. They lead to reduced milk yield and weight loss, apart from causing reproductive and clinical problems in dairy animals like rough skin, anaemia and diarrhoea. Besides, a significant cost is incurred on the treatment of the affected animals. Young animals are more susceptible to parasites than adults. Adult animals reared under poor living conditions are also highly susceptible.

Endoparasites (worms)

These are a major problem affecting farm animals. Endoparasites, also called internal parasites or worms, live in the body of a host animal. Eliminating or lowering the rate of parasites in farm animals is an important animal husbandry practice. It can be achieved by de-worming the animals.

These parasites lay eggs in the intestine of the infected animal. When the animal excretes, the eggs of the parasites also come out along with the excreta. As a result, the field, where the animal is grazing and excreting gets contaminated, leading to the spread of infections in other animals, who ingest these harmful parasites or worms while grazing. Due to their grazing behaviour, farm animals are prone to parasitic infections.



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Endoparasites rob the host animal of nutrients and blood. Therefore, it is important to control the occurrence and spread of internal parasites in animals.

De-worming

It is a practice of administering medicines to the infected animals and helping them get rid of internal parasites or worms. The medicines can be administered either orally or through injection. However, it is difficult to completely eradicate worms from a farm. The aim of de-worming is to improve the immunity of the animals and prevent them from catching chronic parasitic infections, thereby, protecting farmers against production losses.

Selection of de-wormer

It has been observed that worms develop resistance against repeated use of a particular de-wormer. Therefore, it is advisable to use de-wormers selectively and wisely. It is recommended that a de-wormer must not be repeated every time. Rather alternative de-wormers must be used. Many de-wormers are available in market but the choice of a de-wormer depends on various factors like age of an animal, its weight and effect of the de-wormer against different parasites. A de-wormer must have the following properties.

- It must cover a wide range of parasites and be active against almost all stages of parasitic growth, i.e., from larva to the adult stage.
- It must not have side effects on the animal. Some drugs may induce vomiting, pain at the injection site or irritation to the skin.
- It must be suitable from practical and economic points of view.
- It must not decompose when exposed to temperature, sunlight and humidity. In other words, it must have a longer shelf life.
- The selected drug must be economical and easily available in market so that dairy farmers can afford it. Besides, it must be easy to use, for example the drug can be fed to the animals by mixing in the feed.



Administering de-wormer

A de-wormer is, usually, administered orally or injected into the animal.

Oral

De-wormers are, usually, available in liquid form, boluses and tablets. Liquid medicines are administered into the infected animal through the mouth with the help of syringes, bottles and drenching guns. Boluses and tablets can be placed deep into the animal's mouth or crushed to powder form, which is then dissolved in water and put into the mouth of the animal with the help of a syringe minus the needle. Sometimes, de-wormers are mixed in the feed. However, in this method, the animal may not always get the required dosage of medicine due to wastage of feed or it may not be able to consume the whole feed. So, it is the least preferred method.

Injection

A number of de-wormers are available as injectable preparations. The prescribed route of injection for a particular de-wormer must be followed strictly.

De-worming schedule

- An animal must be administered a de-wormer from the first week of its life.
- De-worming must be done every month for the first six months, and thereafter, once in three months. Adult cattle can be dewormed once a year.
- A de-worming drug and dosage must be recommended by a veterinarian and be administered under the person's supervision.
- Attention must be paid to dosage to check side effects of a drug on an animal and see to it that it does not develop resistance against the drug.

Ectoparasites

Ectoparasites are organisms that live in or on the skin of an animal but not in the body. They cause damage to the skin, and adversely affect the health and productivity of the animal. Ectoparasites lead to reduced production, in terms of milk, meat and wool,



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thereby, causing huge losses to a farmer. The losses also include the cost that the farmer incurs in the treatment of the ailing animal. These may even cause the death of the animal. Ectoparasites cause harm to livestock throughout the year. But these are most prevalent during summer and rainy seasons.

Harmful effects on dairy animals

Ectoparasites lead to reduced milk yield and retarded growth of the host animal. In some animals, they cause damage to the skin and hair (wool in case of sheep) due to constant rubbing and scratching because of itching. Some diseases are even transmitted to healthy animals from infected ones through ectoparasites. The harmful effects of ectoparasites are shown in Fig. 2.4.

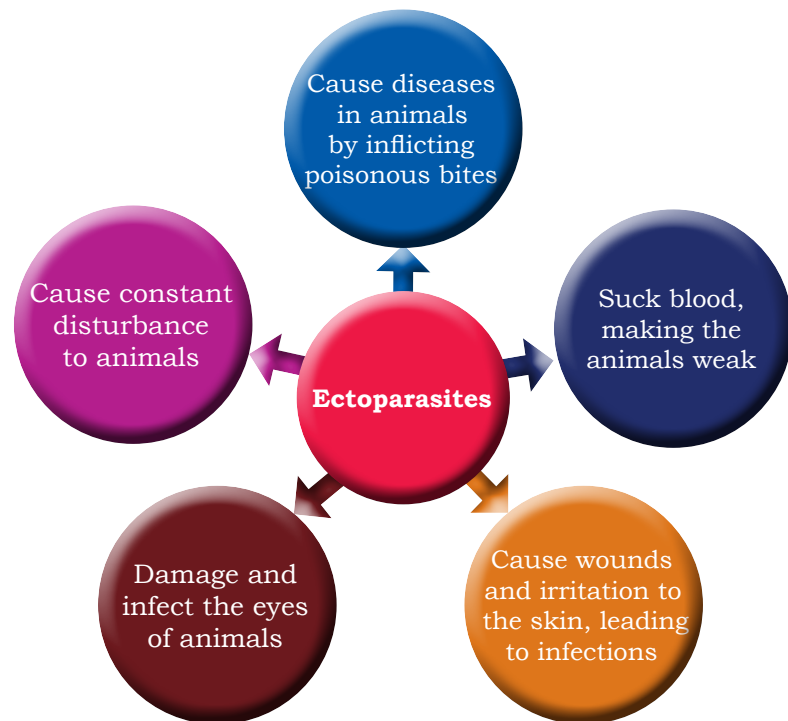


Fig. 2.4: Harmful effects of ectoparasites on animals

Common ectoparasites

Ticks

These thrive on the body of an animal till treated or controlled. They feed on the blood of the host animal. Their bite causes swelling, redness, irritation and itching. They transmit several diseases to the animal.



Mites and lice

They live on the animal's hair and body surface (Fig. 2.5). Lice and mites are permanent residents on the animal's body, and feed on its skin tissues and blood.

Flies

These feed on blood, sweat, skin secretions, tears, saliva, urine and faeces of the animals (Fig. 2.6). They puncture their skin or infest on the wounds. Flies serve as carriers of diseases as they transmit diseases from infected to healthy animals. They also cause irritation and disturbance to the animals, which result in weight gain and reduced milk yield.

Control of ectoparasites

Heavy infestation of ectoparasites results in poor health of the animals. Several medicines for external application are available to check the spread of ectoparasites. However, it is difficult to completely eradicate ectoparasites from a farm. There are several practices directed towards controlling the population of ectoparasites and reducing it to tolerable levels.

Ectoparasite population can be controlled only by adhering to an integrated approach, in which preventive measures are followed in the entire farm, which includes the animals and their sheds. Farmers need to follow effective farm management practices to reduce and check the spread of ectoparasite population. It includes maintaining farm hygiene and health of the animals, trimming grass around the sheds, reducing moisture in and around the sheds by covering the drains, controlling water run-offs and guttering, and ensuring the maintenance and upkeep of sewer lines.

Immediately upon arrival to a farm, all new animals must be treated with ectoparasiticides (agents that kill parasites) to check the occurrence of new parasites in the existing animals. If it is not effective and

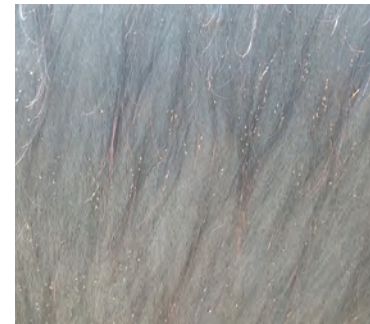


Fig. 2.5: Lice lodged in the skin of a buffalo



Fig. 2.6: Flies puncture the animal's skin or infest on wounds.

ectoparasites still manage to find a way to the farm and infect the animals, treat them immediately as per the veterinarian’s advice to check their spread. A single dose of ectoparasiticidal treatment may not be enough to control the spread of ectoparasites. The first treatment will only kill active parasites present on the animals’ body. A second treatment is required after 15–21 days to kill ectoparasites that might have hatched from the eggs since the first treatment. Besides treating the affected animals, it is necessary to clean and disinfect the sheds, paddocks and barns with disinfectants so as to kill the parasites and their eggs.

Despite all these efforts, some active ectoparasites and their eggs may still be found on the ground and walls of animal sheds. These ectoparasites can live on surface for days without nutrition. Therefore, insecticides must be sprayed on buildings, paddocks, barns, etc., every two weeks.

Methods to check ectoparasites

Ectoparasiticides may be applied to animals by several methods. However, these must not be administered to sick animals. Fig. 2.7 shows some of the common methods used for checking the spread of ectoparasites.

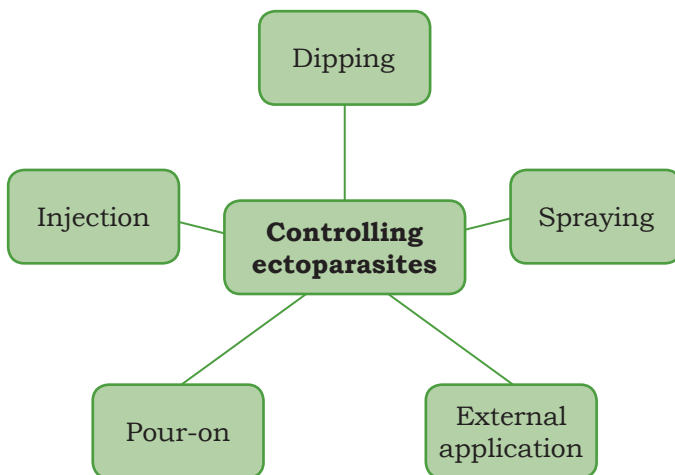


Fig. 2.7: Various methods to control ectoparasites

Dipping

It is preferable for small-sized animals like sheep and goats. It is effective if a large number of animals is to be treated. An affected animal is lifted and dipped into a tank filled with an ectoparasiticide solution, ensuring that its head is also dipped inside. Dipping must be done early in the morning, so that the animal is not immediately exposed to the hot Sun. Dipping is not recommended if heavy rain is expected as the medicine may get washed off.



Spraying or external application

Using sprays is the most common method of applying ectoparasiticides. It is effective, especially, if a small number of animals is to be treated. If a spray is not available, then a recommended medicine may be applied on to the animal with a paint brush or cloth. The affected animal must be tied securely before the medicine is applied. The medicine must be applied from the head to the tail, covering all areas of the body. While applying the medicine, the eyes, nostrils and mouth of the animal must not be exposed.

Pour-on medicine

A small volume of recommended medicine for treating ectoparasite infection is poured along the backline of the animal (Fig. 2.8). The exact quantity of a pour-on medicine to be applied is measured on the basis of the animal's body weight and the extent of parasitic infection. The medicine is measured in micrograms (mcg) with the maximum amount to be administered being 500 mcg. It disperses over the body surface and kills the infesting ectoparasites. It is an effective method of controlling the spread of ectoparasites.



Fig. 2.8: Medicine being poured along the backline of a cow

Injection

Some medicines can be injected into the animal through subcutaneous route (Fig. 2.9). These medicines can control a range of parasites (both endoparasites and ectoparasites). These are, generally, more expensive than anti-bacterial, anti-viral or anti-fungal medicines used to treat other infections.



Fig. 2.9: A medicine being injected into a calf through subcutaneous route

Precautions during medicine application

Appropriate dosage

Always administer the recommended dosage of medicines. Too high concentration may cause harm to the animals, whereas, too low concentration may develop drug resistance in them.

Wear protective clothing

People involved in handling and administering medicines to the animals must wear protective clothing, i.e., mask, goggles, gloves and boots to avoid contact with chemicals. If there is a contact, wash the area immediately with soap and water. Spraying or applying medicines on the animals must not be done in a confined and non-ventilated area.

No dosage to sick animals

Ectoparasitocidal medicines must not be administered to sick animals or those under stress because these may cause further sickness and side-effects in them.

Provide feed and water to animals before dipping

The animal must be provided with sufficient feed and water before being dipped in medicine solution as thirsty or hungry animals can drink the solution or lick their own body, which may be harmful.

Appropriate disposal of leftover medicines

Care must be taken that leftover medicines and chemicals do not contaminate the environment and are disposed of appropriately. Leftover medicines and chemicals must never be disposed into rivers or ponds. These can be drained into pits, which must be at least 150 metre away from water sources.

Cleaning of used equipment

Sprayers and other tools and equipment used in administering medicines to the affected animals must be cleaned immediately after use.



Practical Exercise

NOTES

Activity

Identify ectoparasites in a nearby dairy farm.

Material required: forceps, magnifying glass and writing material

Procedure

- Visit a dairy farm in your locality.
- Examine the animals living there for ectoparasites.
- Collect some ectoparasites with the help of forceps.
- Identify the ectoparasites and note down their names in your notebook.
- Present it before the class.

Check Your Progress

A. Multiple Choice Questions

1. The methods of controlling ectoparasites is/are _____.
(a) dipping (b) hand spraying
(c) injection (d) All of the above
2. Insecticides must be sprayed on buildings, paddocks and barns with a suitable chemical every _____.
(a) two weeks (b) two months
(c) three months (d) None of the above
3. Dipping must be done in the _____.
(a) afternoon (b) early morning
(c) evening (d) Any time
4. For effective control of ectoparasites, a second treatment is, usually, required after _____ of the first treatment.
(a) 7–9 days (b) 15–21 days
(c) 1–2 months (d) 3–4 months
5. A person handling and applying ectoparasiticide to animals must wear _____.
(a) only gloves (b) only goggles
(c) only mask (d) All of the above

B. Fill in the Blanks

1. _____ are organisms that live on the skin of other animals.
2. Ticks feed on the _____ of an animal on which it lives.
3. Ectoparasites are responsible for the transmission of _____.
4. For pour-on method, the preparation must be poured along the _____ of an animal.
5. Some ectoparasiticides can be injected into animals through _____ route.



NOTES

C. Mark 'True' or 'False'

1. Heavy infestation of ectoparasites is, usually, associated with poor health.
2. A single treatment with ectoparasiticide may be enough for checking the spread of ectoparasites.
3. Dipping of an animal can be carried out in all seasons.
4. Ectoparasiticides must not be administered on to sick animals.
5. Ectoparasite control cannot be achieved by an integrated approach.

D. Match the Columns

A	B
1. Worm	(a) Tank filled with solution
2. Ectoparasite	(b) Applied on the backline of animals
3. Dipping	(c) Administered orally or through injections
4. Pour-on	(d) Endoparasite
5. De-wormer	(e) External parasite

E. Crossword

		¹ P				
² M	O	R		I	N	G
			³ W			
				⁴ F		Y
⁵ H		I				
			M			
		E				

Across

2. Dipping should be done during _____ time.
4. _____ feed on the blood, sweat, skin secretions, tears, saliva, urine and faeces of animals. They puncture the skin directly or infest on wounds of the animals.
5. Mites and lice live on _____.

Down

1. Organisms that live on or in another organism, known as the host, obtain nutrients from the body of the host animal.
3. Another name of internal parasites is _____.



SESSION 3: MANAGEMENT PRACTICES FOR MAINTAINING ANIMAL PRODUCTIVITY

Identification of dairy animals

Record keeping in a livestock farm starts with the identification of animals. It allows a dairy farmer or entrepreneur to maintain records, such as an animal's date of birth, production, health history and other important management information like data on feed, vaccination and body weight. Hence, accurate and precise record provides adequate information to the dairy farmer or entrepreneur to make individual or herd management decisions. Accurate identification of an animal, coupled with its record card, plays an important role in animal breeding and production, as well as, eradication and prevention of several diseases, and food safety. Animal record cards also help trace outstanding or poor performing animals in a farm.

Animal identification methods

There are many animal identification methods as shown in Fig. 2.10. But a method that best fits the needs of a dairy farm must be selected. Tagging is the most commonly used method for the identification of animals.

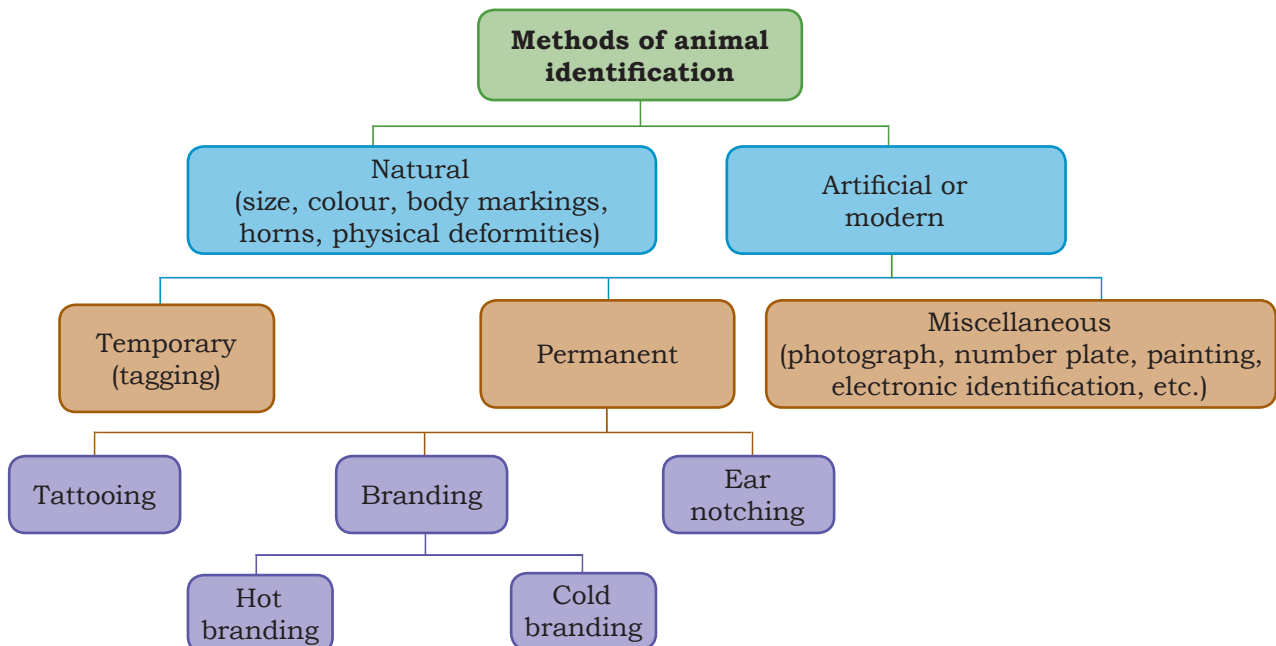


Fig. 2.10: Various methods of animal identification practised in a dairy farm





(a)



(b)

Fig. 2.11 (a and b): A buffalo and calf with an ear tag

Tagging

Ear tags are the most common form of identification used in all farm animals as these are cheap and easy to fix. Besides, the number mentioned on the tag is readable from a distance [Fig. 2.11 (a and b)]. Tags must, preferably, be fixed in the centre of the ear between the second and third cartilage ribs, approximately at a distance of one-half from the base to the tip of the ear. The pliers used for tagging are calibrated to fix the tag in a manner that is not too tight. Tags can be fixed to one or both the ears.

Tattooing

Tattooing is not practised in buffaloes due to their dark skin tone. It is, generally, done at a young age. For tattooing, clean the left ear from the inner side with spirit. Remove surplus hair. Fix a number in the tattooing machine. Apply tattooing ink and tattoo the number using the machine. The tattoo must be applied on a light coloured area of the animal's skin. Prominent veins must not be ruptured in the process. Restrain the animal at the time of tattooing.

Branding

Like tattooing, branding, too, is not practised in buffaloes due to their dark skin tone. 'Branding' refers to administering some mark, either letters (A to Z) or numbers (0 to 9) on the animal's skin with a hot or



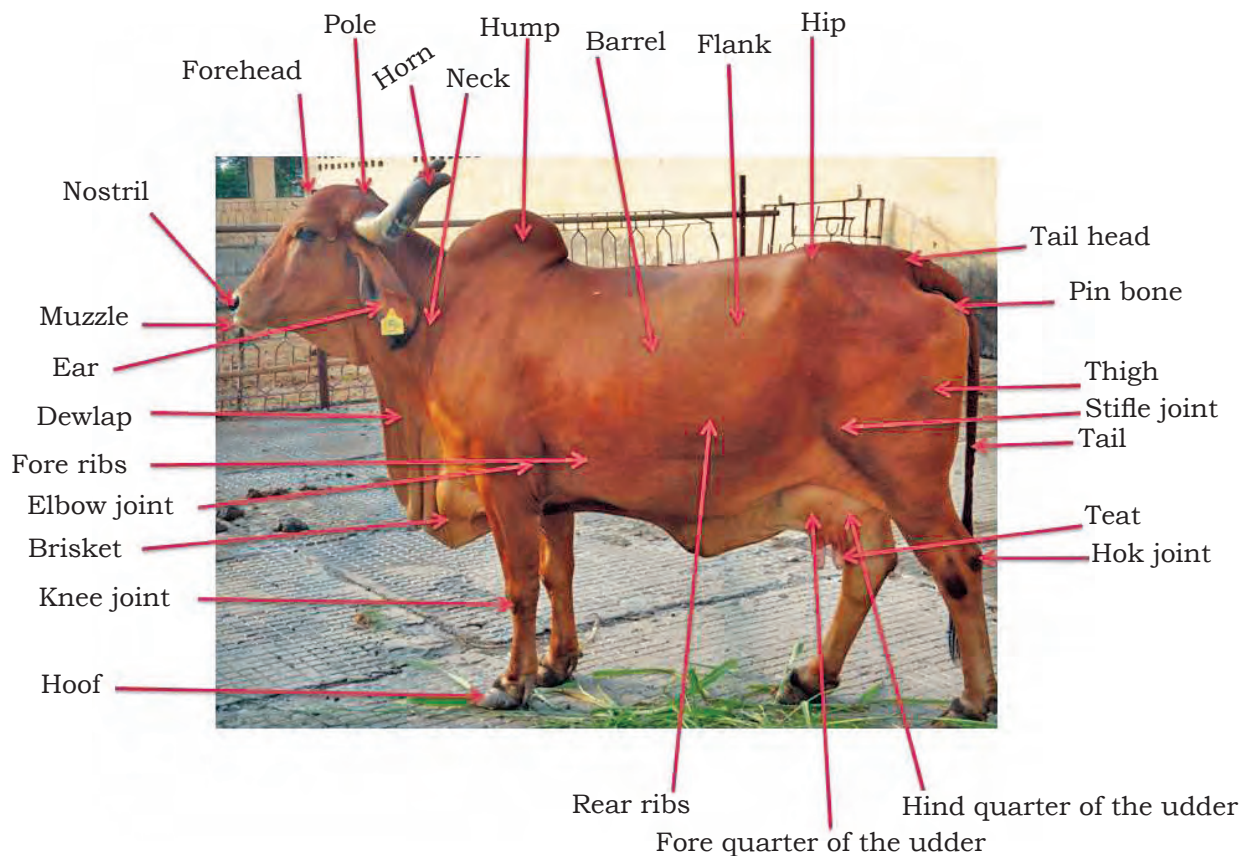


Fig. 2.12: Body parts of a cow

cold iron rod or chemicals. It leaves a permanent scar and damages the epidermal cells of the area. Branding mask can be easily seen from a distance. Heifers need to be at least one-year old for branding. The usual sites for branding are shoulders, hind quarters, cheek and horns of the animal.

Electronic Identification Device

There are several forms of electronic identification that are used. Electronic Identification Device (EID) options include the following.

- Bar-coded, tamper-resistant ear tags
- Radio frequency identification (RFID) ear tags
- Injectable transponders
- Rumen boluses

Heat detection

Heat or 'estrus' is the period of intense sexual urge or excitement experienced by female animals. This is the period when a female accepts a male for mating. When

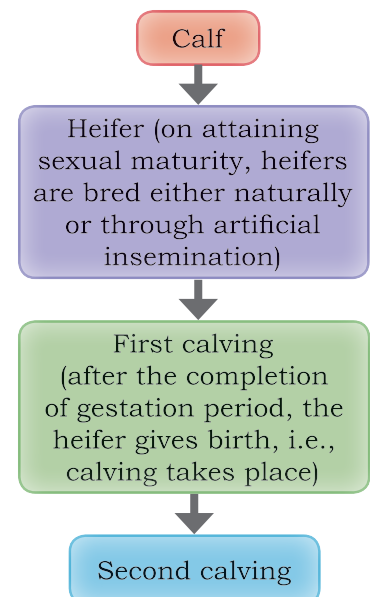


Fig. 2.13: Different stages of reproduction in a cow and buffalo

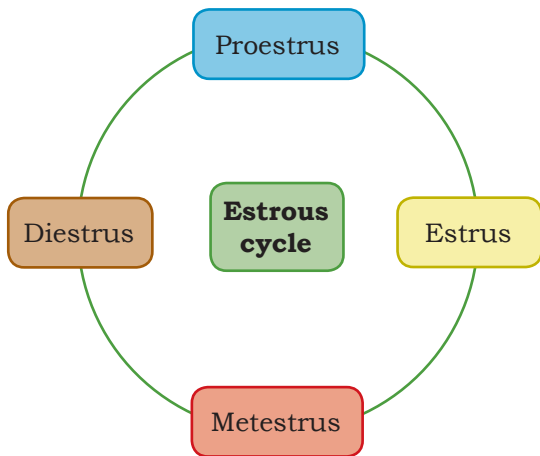


Fig. 2.14: Phases of estrous cycle in cows and buffaloes

the female is in heat, the male can detect it and mating takes place.

In dairy farming, females are reared for milk production. Long term and consistent milk production solely depends on regular and successful reproductive activity by dairy animals. After giving birth, milk production (lactation) starts in females. Therefore, a desirable level of reproductive efficiency must be maintained to get optimum production. A farmer, therefore, has to detect female animals, in heat and ensure that mating takes place at appropriate time for successful conception. Heat detection is one of the toughest tasks in dairy farming.

Estrus is the only observed phase of the entire estrous cycle. The average estrous cycle in cows and buffaloes is 21 days. However, it can be as short as 18 and as long as 24 days. The estrous cycle starts with puberty and continues till successful pregnancy. The four phases of estrous cycle are shown in Fig. 2.14.

Signs of heat (estrus)

Detection of heat is one of the most important and difficult activities in a dairy farm. By simply observing the changes in a female animal's behaviour, one can detect if it is in heat. The signs of heat are classified into primary and secondary (Fig. 2.15).

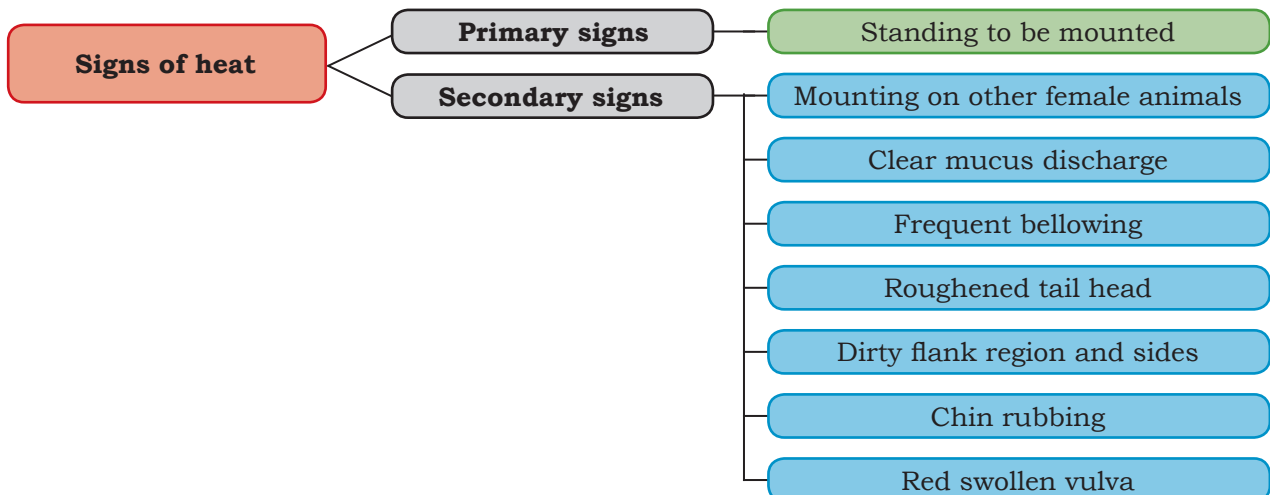


Fig. 2.15: Primary and secondary signs of heat





Fig. 2.16: Primary sign of heat — mounting activity in a buffalo

Heat detection methods

Heat or estrus detection is the most important activity of reproductive management. Accurate heat detection is essential for regular calving. Under natural conditions, a male has the ability to detect a female in heat through sensorial ability and mating takes place. In intensive production system, natural mating is discouraged in dairy animals. Cows and buffaloes are inseminated artificially either by liquid semen or cryo-preserved semen. This process is called ‘Artificial Insemination’ (AI). As the insemination activity is human driven, it is important to detect the heat period of a cow or buffalo, and conduct AI to ensure pregnancy.

When cows and buffaloes are confined to a place, estrus expression is not intense. Sometimes, it is not visible and may even go unnoticed. Even teaser bulls are unable to detect it at times. Weak estrus activity is closely related to productivity and genetic make-up of the cow or buffalo. If the cow or buffalo is unable to conceive at the apt time, there will be an increase in the ‘open period’. As the open period increases, calving interval also increases. As a result, the profitability of a dairy farm decreases drastically.

In developing countries, AI is not a popular method because of inefficient detection. Heat detection can be successful only in the following conditions.

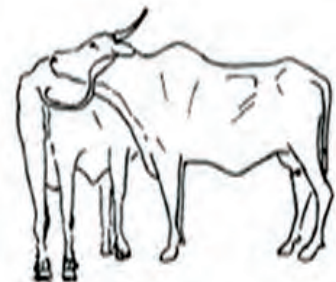
- Accurate identification of cows and buffaloes
- Maintenance of breeding records
- Presence of trained personnel
- Spending sufficient time to observe estrus signs in cattle



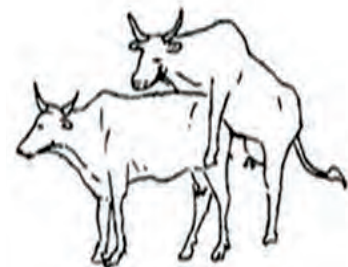
(a) Lips of the animal’s vulva are red and swollen



(b) Clear, thin mucus hangs from the vulva



(c) The animal sniffs and is sniffed by others



(d) The animal stands still till in heat

Fig. 2.17 (a–d): Visible signs of estrus in cows and buffaloes



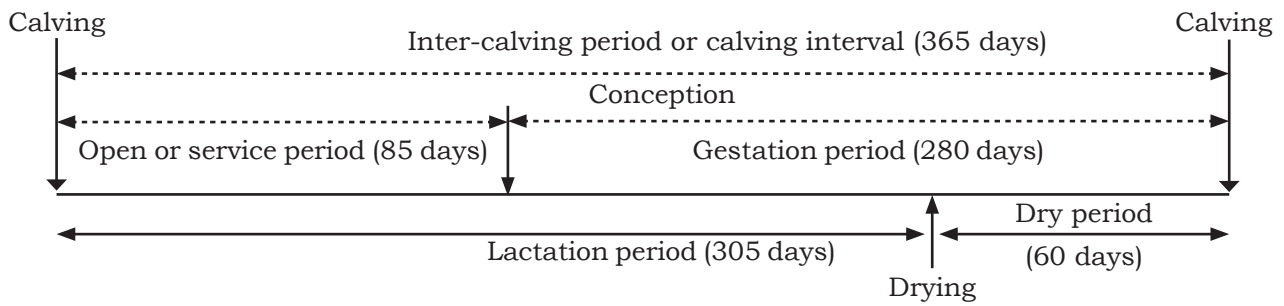


Fig. 2.18: Diagrammatic representation of periods between two successive calvings in a cow

Fig. 2.19 depicts the various methods commonly practised in dairy farms for detecting female animals in heat.

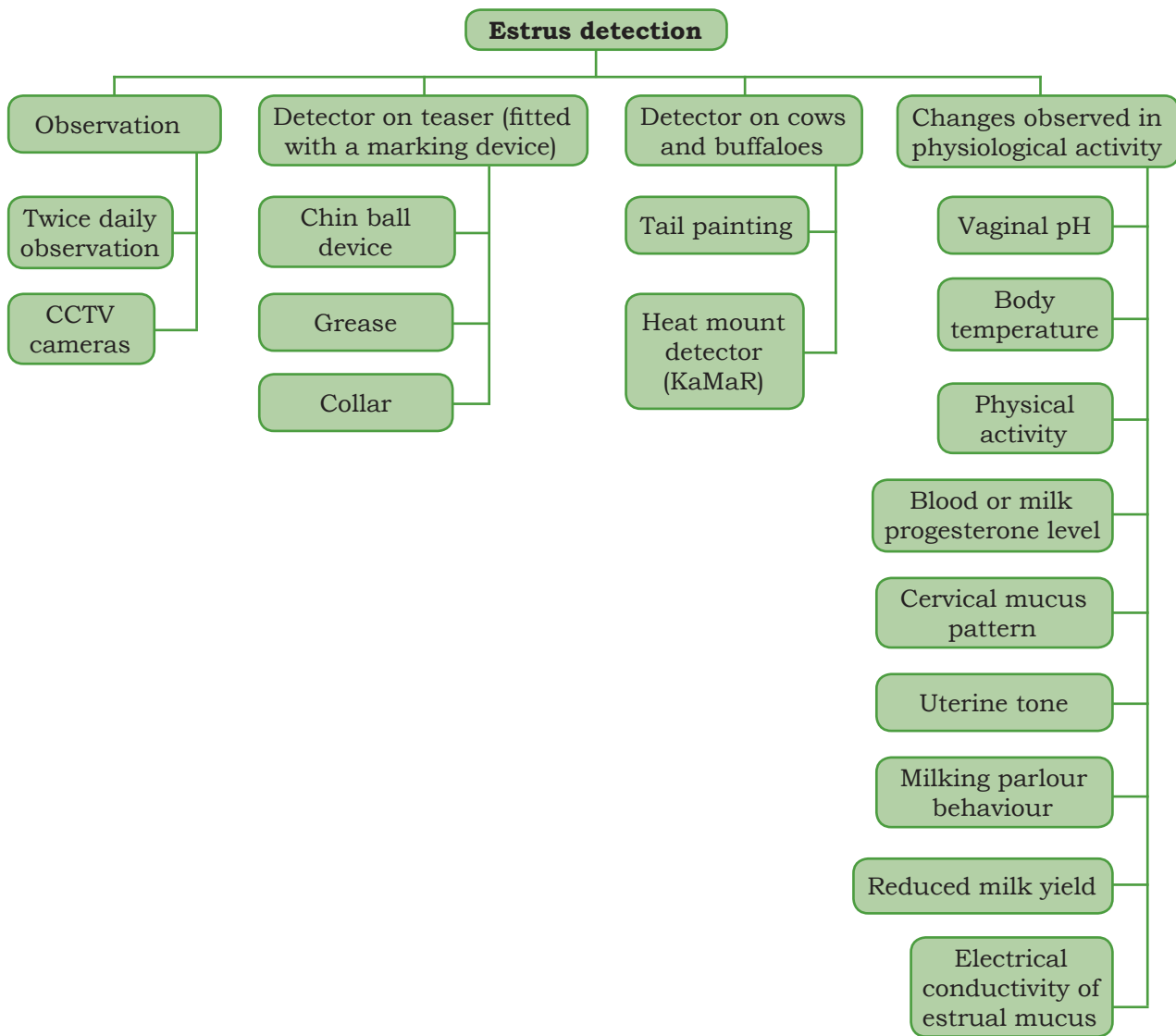


Fig. 2.19: Various heat detection methods practised in a dairy farm



Observation

It is an easy and efficient method for detecting a female animal in heat. Maximum estrus activity occurs from 6 pm to 6 am, and during cooler parts of the day, when farm animals, including cows and buffaloes, are more active. Observation must be carried out for at least 30 minutes at a stretch, two to three times a day, especially, during early morning, late in the evening or at night. Mounting activity in cows and buffaloes in estrus shows that it is not distracted by regular farm activities, such as feeding and milking. Some large commercial farms install CCTV cameras, which record all activities of the animals 24×7. Hence, the cows and buffaloes in estrus can be easily identified. Therefore, it must be ensured that the identification marks on the animals are visible.

Detector on teaser bulls

Usually, bulls or bullocks are used as teasers. Cows and buffaloes, having cystic ovary treated with androstenedione, may also be used for this purpose. Bulls that are surgically vasectomised or have a deflected penis, and bullocks treated with estrogen are, generally, used as teasers. Some farms allow only one teaser in a herd of cows or buffaloes that too at a particular time. A farmer observes and notes down the number of cows or buffaloes mounted by the teaser bull. However, this is possible only in a medium sized farm as there will be only few animals in heat on a particular day. In large farms, the teaser is, usually, fitted with some marking device and allowed to stay with the herd throughout the day, so that it leaves a mark over the cows or buffaloes while mounting. A marking device is attached to the bull's chin (chin ball mating device), brisket (grease) and collar (pad soaked in dye or grease).

Though the teaser is efficient in detecting heat in female animals, this method has some limitations. Extra cost is incurred in feeding and management of teaser bulls like upkeep, medicines and surgery. Sometimes, it becomes dangerous for workers to control the teaser.



Artificial Insemination

Artificial insemination (AI) is a process, wherein, a male animal's semen is collected, processed, stored and artificially introduced into the reproductive tract of female animal showing signs of estrus, so that it conceives. It is called so as it is a human-driven activity. In the natural process, a bull mounts on to a cow or buffalo when the latter is in heat. This process is called 'natural service' (NS).

Advantages

- Superior bulls are used for upgrading and crossbreeding, thereby, improving the overall genetic merit of the herd.
- Even several years after the death of such a bull, its semen can be preserved and used for insemination purpose.
- A dairy farm need not maintain such a bull round the year, thereby, reducing the management cost.
- AI helps in rapid identification of fertility problems in female dairy animals.
- There is decreased risk of disease transmission in artificial insemination.
- The animal handler is safe as there are no aggressive males in the farm.
- The problem of using heavy bulls on younger heifers can be eliminated.
- In AI, the number of bulls required for breeding purpose is reduced considerably.
- Frozen semen technology facilitates cross-country transport of semen instead of bulls.
- The genetic merit of exceptional bulls can be used widely in this method.
- Recent advance technologies like embryo transfer are possible only because of AI.

Disadvantages

- A skilled technician is required for carrying out artificial insemination in female animals, which may add to the farmer's overall cost.



- Detection of animal in heat is mandatory. If signs of estrus go unnoticed, AI may not yield the desired result and may cause a major loss to the farmer as animals are mainly reared for production purpose. Therefore, detection of heat at accurate time is important.
- If an infected bull's semen is used for artificial insemination, it may pose a threat to female animals in the farm. If not detected in time, then chances of disease transmission is high.
- Breakage of 'cold chain' during the transportation of semen affects the success of AI. 'Cold chain' refers to storing and maintenance of semen in cold temperature, i.e., at -196°C in liquid nitrogen.
- It requires more time than natural service.
- Human error in executing the process of AI may adversely affect the fertility of the animals.

When and how to inseminate

The best time to inseminate a cow or buffalo is 12–18 hours after estrus is detected. A common rule of am–pm can be adopted for inseminating the animal. Under this rule, an animal that shows heat in the morning must be inseminated in the evening the same day and one that shows heat in the afternoon needs to be inseminated in the morning the next day.

AI must be done at the appropriate time and place. An ovum is released from the ovary 10–14 hours after the end of heat. The life span of an ovum is 10–12 hours inside the uterus of the cow or buffalo. Therefore, it must be fertilised within 10 hours of ovulation, else it will die. In contrast, spermatozoa are viable for 24 hours at the same place and must undergo some chemical changes (like capacitation) inside the uterus before fertilisation.

Insemination technique

The success of AI depends on the skill of the inseminator, as well as, the sanitary conditions maintained during insemination. Two methods are commonly used for AI — speculum and recto vaginal.



Speculum method

Here, speculum lubricated with paraffin is inserted into the vagina of the animal for dilation. The cervix is detected visually by the use of a headlight torch. An inseminating pipette, containing diluted semen, is inserted into the vagina of the animal. The semen is deposited into the uterus (in front of the cervix). This method is suitable for a less trained person.

Recto vaginal method

This is the most widely used method as it is simple and easy to carry out. Fig. 2.20 shows the steps followed in this method.



Fig. 2.20: Steps followed in recto vaginal AI method



- Step 1: Secure the cow or buffalo in a service crate.
- Step 2: Wear a glove in the left hand and lubricate it with a soft soap. The hand is then inserted into the animal's rectum, making a cone with the fingers and thumb.
- Step 3: Take out dung from the rectum (back raking).
- Step 4: Pull the cervix proximally for easy insertion of the insemination gun.
- Step 5: Palpate the uterus and hold the cervix.
- Step 6: Check redness in the vulva.
- Step 7: Dilate the vulva lips and insert the insemination gun at 45 degree angle.
- Step 8: Push it forward and manipulate the gun to pass through the cervix.
- Step 9 Slowly deposit semen at the entrance of the uterus.

Pregnancy detection in cows and buffaloes

Detection of pregnancy in cows and buffaloes after mating is directly related to their overall productivity, and ultimately, profitability of a dairy farm. Pregnancy diagnosis is based on the exhibition of some signs or detection of certain pregnancy related hormones in the animal.

An animal owner may sometimes get misguided by the signs of pregnancy that the animal shows. Therefore, it is important to observe the animal and check it for pregnancy so as to provide it with better care. If the animal does not get pregnant, it is treated for infertility or other reproductive disorder (if required). This helps in shortening the unproductive period of the animal and also saving its life. If the problem is not curable, then culling is the only way out. The method of pregnancy diagnosis must be affordable and accurate.

Signs of pregnancy

The animal must be carefully observed as many signs do not always give an accurate result. Common signs that indicate pregnancy are as follows.



NOTES

Non-return to estrus

If the cow or buffalo does not exhibit estrus 21–24 days after mating or AI, then it can be assumed that it is pregnant.

Increased appetite

The appetite of the animal increases as pregnancy advances.

Tendency to gain weight

Pregnant animals have a tendency to gain weight.

Increased volume of abdomen

In the third trimester of pregnancy, there is a significant increase in the abdominal volume of the animal.

Direct methods of pregnancy detection

As the name suggests, this method involves direct detection of tissues and associated fluids in the foetus either manually or with the help of an electronic equipment.

Per-rectal examination

Per-rectal palpation of female reproductive organ is the most common method of pregnancy diagnosis. It is, usually, performed between 35 and 42 days after mating or AI. Per-rectal examination is a quick method (an experienced person takes 1–2 minutes). It is a reliable and safe method of pregnancy diagnosis. However, per-rectal examination may sometimes provide erroneous information or result due to certain diseased conditions in the uterus like pyometra or mucometra.

Palpation process

The animal is restrained in the service crate. Most people use the left hand for rectal palpation, although either hand may be used. Wear a full sleeve glove on one hand (usually, the left hand) and apply some lubricant. Then, insert the hand gently into the rectum of the cow or buffalo. Rectal contraction prevents the hand to make palpation. So, allow the contractions to pass, and then, palpate the reproductive organs.



Trans rectal ultrasonography

An ultrasound device can be used to carry out per-rectal pregnancy diagnosis. A rectal probe is placed inside the animal's rectum above the uterus. The probe produces sounds that diffuse into the adjacent tissues and reflect to the probe. It generates an electrical pulse and the video is displayed on the monitor kept nearby. A black image is generated by the fluid-filled placenta as the ultrasound is absorbed by the fluid. Besides, light grey or white image is produced by the dense structure of the embryo.

Ultrasonography is a more reliable method than per-rectal examination. It helps in the early diagnosis of pregnancy (25 days after mating or AI) and determination of embryo or foetus viability. Besides, it reduces chances of error (false negatives and positives) in pregnancy diagnosis. However, the high cost of the instrument is a major limitation of this method.

Management of the calf from birth

Cleaning the nostrils

As soon as a calf is born, its mouth and nostrils must to be cleared of 'mucus'. Mucus must be removed from the throat too. Straighten the calf's neck so that the airways are not obstructed. Lifting the calf up by the hind legs will help drain out fluids from its respiratory tract. Cold water may be sprinkled on its face to induce gasp reflex and breathing. The umbilical cord must not be cut until the calf starts breathing. If the calf is not able to breathe, artificial respiration may be administered.

Initiation of breathing

After the calf is born, some stimulation may be required to induce breathing. Stimulate the calf by rubbing it briskly, tapping it on the ribs or tickling its nostrils with a straw. The simplest method to induce breathing is to insert an inch or two of a straw into the calf's nostrils and move it in and out. The calf will shake its head, sneeze and start breathing within 5–10 seconds. This method is also recommended for healthy calves to help clear the lungs.



Cutting the umbilical cord

The umbilical cord is cut at a distance of 1.5 inch from the body. The cord attached to the calf's body is dipped into a disinfectant like tincture iodine solution. The remaining portion of the umbilical cord is buried in soil.

Colostrum feeding

Colostrum is the thick yellowish fluid secreted by the mammary glands of all mammals, including cows and buffaloes, during the first 4–5 days of parturition (birth of a calf). Being the first milk produced by mammals, it is rich in antibodies, energy, protein, vitamins and minerals, and hence, called 'liquid gold'. Colostrum must be fed thrice a day for the first three days after the calf is born. It precedes the production of 'true milk'. The antibodies present in colostrum protect the newborn from diseases and pathogens during the early days (about one month) of its life. The type of antibodies the colostrum contains depends on the antigens to which the dam was exposed to during vaccination at the time of pregnancy.

The total solid and immunoglobulin content of colostrum vary considerably from one animal to another. Colostrum contains about 24 per cent solid and 6 per cent immunoglobulin content. The immunoglobulin content varies from 2–23 per cent (whole milk, normally, contains less than 0.1 per cent) and is directly related to solid content present in the colostrum, which varies from 17–36 per cent. The appearance of colostrum is an indication of its quality.

A colostrometer is used to indicate the quality of colostrum. It estimates solid content present in the colostrum by measuring specific gravity. Good colostrum has a specific gravity above 1.05.

A calf is born without any immunity (resistance) to infections and diseases. A newborn calf acquires passive immunity when it absorbs the intact immunoglobulins through its intestinal wall. The degree of passive immunity is directly related to the concentration of immunoglobulins in the calf's blood. Calves may not acquire passive immunity when:



- they are not fed enough colostrum.
- they are fed colostrum containing low immunoglobulin content.
- they are not fed colostrum within 30 minutes after birth.
- they lack the ability to absorb immunoglobulins.

Time of first colostrum feeding

A newborn calf must get the first dose of colostrum within 15–30 minutes of birth so that it gets maximum antibodies, followed by the second feeding, approximately 10–12 hours later. In a day, a calf requires colostrum 10 per cent of its body weight. The amount of antibody absorption by the calf depends on the time of colostrum feeding after birth. Antibody absorption through the gut decreases to about 30 per cent within six hours and ceases completely after 24 hours of birth.

Substitute for colostrum

If colostrum is not available to feed the calf due to some reason like death of the dam or the dam being unable to produce it, substitutes can be used. These substitutes are nutritionally not as good as colostrum and lack essential immunoglobulins. One whipped egg, 600 ml of whole milk, 300 ml water and 2 ml castor oil must be mixed to prepare artificial colostrum (Fig. 2.21).

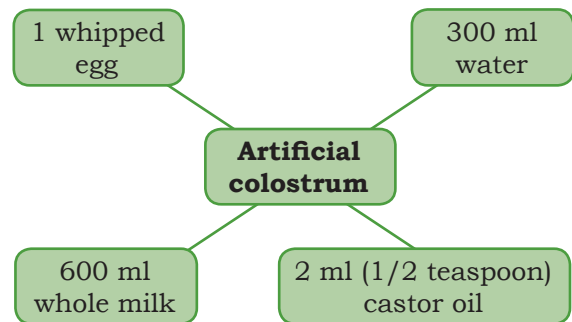


Fig. 2.21: These items are mixed to make artificial colostrum.

Housing

Calves are housed in individual pens until they reach the weaning age. Separate pens prevent the calves from suckling one another and reduce the spread of calfhood diseases. Housing calves individually allows recording a calf's daily feed intake and monitoring it for diarrhoea, other diseases and infections. The pen must be ventilated, cleaned and kept dry. It must be ensured that the calves get fresh air at all times without drafts blowing directly on to them. Ammonia smell indicates that more fresh air is required. Allow more air into the area through broad and continuous openings in the barn to prevent drafts.



The pens need to be bedded in a manner so as to keep the calves comfortable and dry throughout their stay. Sawdust or straw are most commonly used for making the bedding of the animals. Outdoor pens must be partially covered and walled to protect the newborn calves from excess heat, cold, rain and wind. The pens must open to the east so that they get the morning sunlight and shade during warmer parts of the day.

Removal of supernumerary teats

Dairy heifers often have extra teats (supernumerary) in addition to normal ones. Supernumerary teats present no problem if removed when the calf is 1–2 months old. If not, extra teats may interfere with teat cup placement (in case of machine milking). As a result, they become extra functioning milk glands or get infected easily. Extra teats detract from the udder's normal appearance.

Weaning

The literal meaning of the term, weaning, is to start feeding a young animal with feed other than its mother's milk. However, most commonly, weaning is defined as permanent separation of the young one from its mother. The calf may be permanently separated from its mother:

- just after birth.
- while being nursed after first feeding.
- after 2–3 days (colostrum feeding period).
- after 7–8 weeks (up to functional rumen development in the calf).



Fig. 2.22: Weaned calves being kept in a group



The weaned calves can be kept in individual pens or in a group (Fig. 2.22). They must be fed with fresh milk at a temperature of 39–40° C. These calves are taught to suck milk from a pail or a nipple feeder [Fig. 2.23 (a–c)].

Advantages

- It helps maintain a record of the dam's actual milk yield.
- Weaning helps avoid risk of injury to the dam's teats by calves during suckling.
- The risk of complications due to under or over feeding of the calf is negligible post weaning.
- It ensures a hygienic milking process.
- Milking animals, having strong maternal instinct, can be difficult in case of a calf's death. Weaning can help check this problem.
- Weaning allows the calf to be culled at an early age.

Disadvantages

- Weaning is difficult in *desi* (Indian) cows and buffaloes owing to their strong maternal instinct.
- Weaning causes stress in young calves as they are permanently separated from their mothers.
- If milk feeding utensils are not clean, then chances of neonatal diarrhoea in calves increases.
- In weaned calves, the lack of suckling satisfaction may lead to abnormal behaviour like inter-suckling.

Feeding

Feeding ensures rapid growth, health and weight gain in calves. They develop immunity to fight against diseases and infections.



(a) A dairy worker puts two fingers, dipped in milk, into the calf's mouth.



(b) The dairy worker slowly takes the calf's mouth down to the milk vessel with the help of fingers.



(c) The calf learns to suckle milk. The dairy worker slowly withdraws the fingers, encouraging the calf to drink milk from the vessel voluntarily.

Fig. 2.23 (a–c): Training the calf to drink milk

Training the calf to drink or suck milk

Calves may be fed from a nipple bottle, nipple pail or vessel, having a wide opening. One must ensure that the nipple pail or bottle is clean before teaching the calf to suck milk. Raise the nipple while feeding so that the calf keeps its head up while drinking milk.

Training the calf to drink milk from an open pail is easier if it is separated from the dam, i.e., weaned, immediately after birth. Newborn calves that have never been nursed learn quickly. The procedures for teaching the calf to drink milk from an open vessel are as follows.

- Hold the calf and straddle its back.
- Dip two fingers into warm milk, and gradually, draw the calf's head down to the milk while it licks the fingers.
- Remove the fingers when the calf starts drawing milk into its mouth.

Avoid under and over feeding

The amount of feed needs to be adjusted, according to the body weight of the animal rather than its age. The calves of buffaloes are, generally, heavier than those of cows in the same age group. Under feeding of calves causes stunted growth, whereas, over feeding causes digestive problems, which sometimes may even become fatal.

Feeding schedule

As the calf grows, its diet changes from completely liquid to solid, as you may have observed. The different kinds of feed for calves as per their age are shown in Table 2.2.

Table 2.2: Kinds of feed for calves according to age

Age (days)	Colostrum (kg)	Whole milk (kg)	Skimmed milk (kg)	Milk replacer (kg)
1-4	1/10 th of the body weight	—	—	—
5-14	—	1/10 th of the body weight	—	—
15-28	—	1/20 th of the body weight	1/20 th of the body weight	0.1
29-42	—	1	1/10 th of the body weight	0.5



43–56	—	0.5	3	0.5
57–70	—	—	3.5	0.75
71–90	—	—	3	1

Calf starter

The first dry feed offered to calves is called ‘starter’. After few days of birth, the calf must be encouraged to consume dry feed — calf starter and hay — so as to avoid stomach upset and prevent nutritional scours. Dry feed consumption is necessary for the calf to develop a functioning healthy rumen.

Calf starters must not be dusty, mouldy and have a stale or foul smell or flavour as they can adversely affect the animal’s feed intake. A mouldy starter can also adversely affect the calf’s health. The calf starter must be nutritious, easily digestible, palatable, rich in energy content, and contain 18–20 per cent crude protein and less than 7 per cent fibre as low levels of fibrous material add to calf growth. Calf starters must either be coarsely ground, rolled or pelleted. If the starter is finely ground, palatability and feed intake are reduced. Coarse and dry feed promote development of the calf’s first stomach called ‘rumen’ and provide nutrients necessary for animal growth.

Milk replacer

It is a substitute for milk to reduce the cost of calf rearing. It must have nutritional properties equivalent to that of milk. Generally, newborn calves lack enzymes to digest non-milk foodstuff like grains, sugar, vegetables and forages. Therefore, milk replacers are given to them. Milk replacers are made from dried milk and milk by-products like skimmed milk and buttermilk, or with animal or vegetable fats, antibiotics, vitamins and minerals.

A milk replacer must contain at least 22 per cent protein, 15 per cent fat and less than 0.5 per cent crude fibre. It can be given to the calves a fortnight after birth. However, at this age, the calves cannot be kept



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on milk replacer alone. Because of its high fat content (10–25 per cent), it is advisable to mix milk replacer with warm water. The proportion of this mixture and water must be 1:8. Milk replacer may be fed warm but not above 100 °F.

Dehorning

It is the process of removing horns from the bud (disbudding) and preventing their growth. In the process, horn producing tissues are also removed. The process is carried out at an early age. Disbudding can be done up to six months of age. The following are the aims of dehorning.

- To check injury to other animals during fights
- To handle the animals easily without causing any danger to the attendant
- To accommodate more number of animals in less space and feeding area
- To transport the animals easily without the risk of injury to them because of horns
- To feed the animals in group with less interference from dominating animals

Methods of dehorning

Dehorning can be done by various methods, depending on the age of the animal.

Physical methods

Several type of hot iron dehorning tools are available in market. This method is best suited for calves less than two months old. Dehorning by physical methods can be carried out at any time of the year. If carried out correctly, there is no loss of blood or occurrence of wound that can become infected. Some of the tools used for the purpose are as follows.

- Hot iron
- Dehorning knife or spoon (gouge)
- Dehorning tube
- Barne-type dehorner
- Dehorning clippers and saws
- Rubber bands



Chemical (caustic stick or paste) method

This method of dehorning is used in calves aged one to two weeks, during which there is little horn growth. It involves destroying the horn bud tissues by applying caustic paste or using a stick.

Castration

It refers to depriving male animals of their gonadal function by removing their reproductive organs. Castration causes sterilisation (preventing the animals from reproducing), thereby, making the animals docile and easy to handle. Besides, it reduces chances of fight between male animals. Males can be castrated at any time in their lives but it is better at 1–1½ years of age when they are to be used for draft purposes. Burdizzo's castration method is a commonly used method.

Determining the age of animals

Determining the age of the animals is important for the following purposes.

- Selection and purchase of the animal
- Fixing the price of the animal
- Determining the dose of drugs according to the animal's age
- Estimating the age of the animal in the absence of records

Methods to determine age

The actual age of the animals is ascertained from farm records. Indirect ways of determining the approximate age of the animals are used in case records are not available.

Physical appearance

Younger animals are more active than adults. They have light skin tone, smooth coat, and narrow and small hooves. Older animals are large in size, have wide muscle, loose skin, rough coat, larger and wide hooves, and an uneven sole.



Hooves

The hooves of younger animals are relatively smaller in size, smoother and evenly levelled at the sole, while older animals have larger and rough hooves. Besides, their hooves may not be evenly levelled at the sole. However, hooves cannot help ascertain the actual age of the animal. But they may help categorise the animal into age groups, such as very young, yearling, adult, old, etc.



Fig. 2.24: Buffaloes do not have horned rings.

Horned rings

Animals have rings in the horns. In *zebu* (Indian) cows, the first ring appears at the age of three years. The age is calculated as $(n+2)$, where 'n' denotes the number of rings. The formula for calculating the age of an animal is developed on the assumption that the ideal calving interval is one year. One ring is added every year on each calving. This formula is applicable only for females. Sometimes, counting the number of rings becomes difficult. In case of older cattle, where the horns are worn out, this formula cannot be applied. The number of rings in horns gives an indication of the reproductive history of the animal rather than its age, especially, when there is irregular calving or long calving interval.

Formula: Age = $n + 2$ (n = No. of rings)

Dentition

It refers to the study of configuration and confirmation of teeth with reference to their period of eruption through gums. The study of dentition helps ascertain the age of the animal. This method, though not always exact, is reasonably accurate. Recently, a procedure for age determination known as 'mouthing' in cattle has evolved, using eruption time of permanent teeth as the basis.

In animals, teeth serve as organs of prehension and mastication. They are used as weapons of offence and defence. According to their form and location in the mouth, teeth are classified as incisors, canines, premolars and molars. The incisors (central, medial, lateral and corner) are situated in the front. The two



central incisors are called ‘pinchers’, the adjoining ones are the ‘first intermediates’, the third pair is the ‘second intermediates’, and the outer ones are the ‘corners’.

The incisors are prehensile organs in all animals. They are absent in the upper jaw of ruminants (cow, buffalo, sheep, goat, etc.). Instead, they have ‘dental pad’ in the upper jaw. It is a thick, hard gum line that the animal uses for pinching grass and fodder. In the lower jaw, there are eight incisors. In ruminants, the canine teeth are absent. In non-ruminants, canines are behind the incisors and are typical of carnivorous and omnivorous animals.

Canines are used mainly for fighting. There are 24 cheek teeth (premolars and molars), six on each side of the jaw (right upper and lower, and left upper and lower). The anterior three of these six teeth are ‘premolars’ and the posterior three are ‘molars’. The function of the cheek teeth is mastication of food.

Type of teeth: There are two sets of teeth in all species of animals.

(a) Temporary or milk teeth: They may erupt during early life after birth. Deciduous dentition (milk teeth) provides young mammals with a functional, though smaller set of teeth that can be accommodated by its small jaws. Later, these are pushed out by the growth of corresponding permanent teeth.

(b) Permanent teeth: These appear at a certain age and remain throughout the animal’s life.



(a) Central permanent incisors



(b) Medial temporary incisors that have fallen



(c) Medial permanent incisors



(d) Lateral permanent incisors



(e) Corner permanent incisors

Fig. 2.25 (a–e): Different type of teeth in a buffalo

The dental formula¹ of cows, buffaloes, sheep and goats is depicted in Table 2.3.

Table 2.3: Dentition pattern in different livestock species

Species	Temporary/ permanent	Jaw	I	C	P	M	Total	Dental formula
Cows Buffalo	Temporary teeth	Upper jaw	0	0	3	0	20	$2\left(\frac{0\ 0\ 3\ 0}{4\ 0\ 3\ 0}\right)$
		Lower jaw	4	0	3	0		
Sheep Goat	Permanent teeth	Upper jaw	0	0	3	3	32	$2\left(\frac{0\ 0\ 3\ 3}{4\ 0\ 3\ 3}\right)$
		Lower jaw	4	0	3	3		

I: incisors, C: canines, P: premolars and M: molars

¹Dental formula: It expresses the total number of teeth present in a dentition set of a particular species of animal.

An animal's age can be determined by examining the incisors. The calf is born with two central incisors. The other incisors start erupting as it grows. When the calf is five to six months old, all eight temporary incisors erupt. These are replaced by permanent teeth in due course. The permanent teeth are smaller in size as compared to the milk teeth but are broader with a distinct neck between the root and crown, and paler in appearance.

As the animal ages, the teeth start wearing-off. Changes in the teeth at different periods of life indicate the animal's age. At 10 months of age, the central temporary incisors show signs of wearing-off. When the animal is about 15 months old, the two lateral incisors start wearing-off. At the age of about one-and-a-half years, the whole set of milk teeth are flattened. At about two years of age, the two central temporary incisors are replaced by permanent ones. At the age of three years, the two intermediate incisors also get replaced, and at four, the corner incisors are replaced too. When the animal is about five-and-a-half to six years old, the entire set of eight teeth is replaced by permanent ones. When four pairs of incisors are present in an adult animal, there is confusion if the incisors are old, temporary or permanent. The type of incisors can be confirmed by just looking at the cheek teeth. If all six pairs of cheek teeth are present, the incisors are permanent in nature. The eruption of different type of teeth in cattle is shown in Fig. 2.25 (a-e).



Table 2.4: Eruption of different type of teeth in cattle and their age

S. No.	Age of eruption		Incisors	Premolars	Molars
	Cow	Buffalo			
1.	From birth to one month	From birth to four months	All eight temporary incisors	All 12 temporary premolars	—
2.	6 months	9 months	—	—	1 st permanent molar
3.	1 year and 3 to 6 months	1 year and 9 months	—	—	2 nd permanent molar
4.	2 years	2 years and 6 months	Central permanent incisor	—	3 rd permanent molar
5.	2 years and 6 months	3 years	—	1 st and 2 nd permanent premolar	—
6.	3 years	3 years and 6 months	Medial permanent incisor	3 rd permanent premolar	—
7.	4 years	4 years and 6 months	Lateral permanent incisor	—	—
8.	4 years and 6 months	6 years	Corner permanent incisor	—	—

Farm record

The success of livestock farming depends more on management ability rather than hard work. In India, most farmers do not maintain farm records due to illiteracy and lack of awareness. Farm records make it easy for farmers to guide workers, and use machines, livestock and available resources in the best possible way. They may remember important events and data but often the exact information is forgotten. Information about animals, inputs and prices of assets used in the farm are useful in making farm management decisions. Therefore, record keeping is essential for livestock management. Record keeping can be done easily, if animals have some identification mark. Thus, animal records and identification are inseparable.

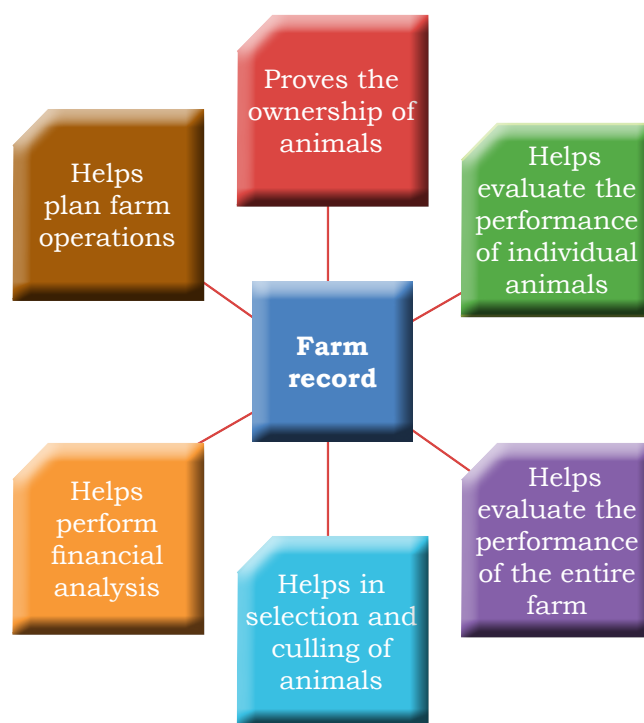


Fig. 2.26: Purposes of maintaining farm record

Characteristics of farm record

A farm record must:

- be easy to maintain.
- provide necessary information.
- avoid duplication.

Types of farm record

There are different types of record that need to be maintained in a livestock farm. A farmer must maintain records relevant to a particular livestock farm. Records of a farm can broadly be classified into three categories (Fig. 2.27).

Technical records	Farm section records	Financial records
<ul style="list-style-type: none">• Daily report register• Artificial insemination or service register• Calving register• Daily milk yield register• Feed stock register• Feeding record• Health record	<ul style="list-style-type: none">• Fodder cultivation register• Field register• Labour register• Muster roll• Tractor logbook• Machinery and equipment book	<ul style="list-style-type: none">• Store stock book• Attendance and pay record book• Feed cost record book• Veterinary expenses record book• Record book for registry cost of fodder seeds• Equipment purchases record book

Fig. 2.27: Classification of farm records

Ways to maintain records

In a livestock farm, records can be maintained in two ways — manually and electronically.

Manual record keeping

In manual record keeping system, various forms are used, varying from pocket size cards to data register.

Electronic record keeping

In electronic record keeping, farm data are maintained in the computer. Data compilation and retrieval are easy in electronically maintained records.

Some of the specimen of different kinds of record maintained in animal farms are given in Table 2.5 (a to j). Farms may develop other records as required.



Table 2.5(a): Breeding record in a dairy farm

S. No.	Cow tag number	Date of calving	Date of first heat after calving	First service		Second service		Third service			First pregnancy diagnosis		Second pregnancy diagnosis		Date of drying	Expected date of calving	Actual date of calving	Remark, if any
				Date of service	Time of service	Bull tag number	Date of service	Time of service	Bull tag number	Date of service	Time of service	Bull tag number	Date	Pregnant or non-pregnant				
1																		
2																		
3																		
4																		
5																		

Table 2.5(b): Calving record in a dairy farm

S. No.	Cow tag number	Date of calving	Bull tag number	Calf tag number	Sex of the calf (M/F)	Weight at birth (kg)	Remark, if any
1							
2							
3							
4							
5							



Table 2.5(c): Growth record of young animals in a dairy farm

S. No.	Animal tag number	Date of birth	Weight at birth (kg)	Monthly body weight (kg)					Weight at first service (kg)	Weight at first calving (kg)	Remark, if any
				1	2	3	...	22			
1											
2											
3											
4											
5											

Table 2.5(d): Lactation record in a dairy farm

S. No.	Cow tag number	Lactation number	Date of calving	Date of drying	Lactation yield (kg)	Peak yield (kg)	Date of peak yield	Lactation length (day)	Dry period (day)	Remark, if any
1										
2										
3										
4										
5										



Table 2.5(e): Daily feeding record in a month in a dairy farm

S. No.	Date	Number of animals	Concentrate (Qtl.)			Green fodder (Qtl.)			Dry fodder (Qtl.)			Others					
			Received	Issued	Balance	Received	Issued	Balance	Received	Issued	Balance	Received	Issued	Balance			
1																	
2																	
3																	
4																	
5																	

Table 2.5(f): Herd strength record maintained on a daily basis in a dairy farm

S. No.	Date	Cows		Heifers	Young males	Bulls	Calves		Total number of animals	Addition of animals		Deduction of animals		Remark, if any
		Milch	Dry				Male	Female		Number	Place	Number	Place	
1														
2														
3														
4														
5														





Table 2.5(g): Record of daily milk yield for a month in a dairy farm

S. No.	Cow tag number	Date of calving	Date												Monthly total milk yield (kg)	Total lactational yield (kg)											
			1		2		3		4			27				28		29		30		31				
			M	E	M	E	M	E	M	E	M	E	M	E			M	E	M	E	M	E	M	E			
1																											
2																											
3																											
4																											
5																											

Table 2.5(h): Vaccination record

S. No.	Date	Name of vaccine	Route of vaccination	Number of animals vaccinated	Tag numbers of animals vaccinated	Next due date of vaccination	Remark, if any
1							
2							
3							
4							
5							

Table 2.5(i): Health checkup record in a dairy farm

S. No.	Date	Name of the test	Disease for which the test is performed	Number of animals tested	Tag numbers of animals	Next due date of checkup	Remark, if any
1							
2							
3							
4							
5							

Table 2.5(j): Herd health record in a dairy farm

S. No.	Date	Animal tag number	History	Symptoms	Treatment	Results (cured/died)	Name of the veterinarian	Cost of treatment	Remark, if any
1									
2									
3									
4									
5									

Practical Exercise

Activity

Visit a nearby dairy farm and note down the calf management practices being followed there.

Material required: animals' birth record, feeding schedule, feed and other relevant records, and writing material

Procedure

- Visit a dairy farm in your area.
- Observe the various calf management practices being followed there.
- Note these down in your notebook.
- Note down the other required data from the farm record book.
- Present it before the class.

Check Your Progress

A. Multiple Choice Questions

1. The best time to inseminate an animal is _____ after the initiation of estrus.
 - (a) immediately
 - (b) 4–8 hours
 - (c) 12–18 hours
 - (d) 18–24 hours
2. The quantity of colostrum that needs to be fed to a calf is _____.
 - (a) 0.5 kg
 - (b) 1 kg
 - (c) 5 per cent of its body weight
 - (d) 10 per cent of its body weight
3. The gestation period of a cow is _____ days.

(a) 260	(b) 280
(c) 310	(d) 340
4. A milk replacer must contain at least _____ per cent protein.

(a) 12	(b) 18
(c) 22	(d) 26
5. Which of the following properties does colostrum have?
 - (a) Rich in nutrients
 - (b) Low lactose content
 - (c) Rich in antibodies
 - (d) All of the above



B. Fill in the Blanks

1. _____ means removing horns from the bud and preventing their growth.
2. The most common form of identification used in farm animals is _____.
3. The gestation period of a buffalo is _____ days.
4. The estrous cycle of cows is _____ days.

C. Mark 'True' or 'False'

1. Milk replacer is fed to a calf to reduce the cost of rearing.
2. Disbudding is done in adult cows.
3. Colostrum is a type of milk obtained from heifers.
4. Branding is a temporary method of identification.
5. The age of farm animals can be determined by dentition.

D. Match the Columns

A	B
1. Tagging	(a) Generally done at a young age
2. Tattooing	(b) Liquid gold
3. Colostrum	(c) Milk substitute
4. Milk replacer	(d) Dry feed
5. Calf starter	(e) Common form of identifying farm animals

E. Crossword

¹ S	² H			³ W		
⁴ T			S		⁵ R	
A	A				E	
	T					
				I		
E				N	R	
R				G	D	

Across

4. Usually, bull or bullocks are used in a dairy farm.



NOTES

Down

1. The first dry feed offered to calves is called _____.
2. _____ is the period of intense sexual urge or excitement experienced by female animals.
3. Permanent separation of the young from its mother.
4. _____ keeping is an essential part of livestock management.





Performing Hand and Machine Milking

INTRODUCTION

The profitability of a dairy farm solely depends on its milk productivity. Every day, dairy farmers have to manage animals and milk them in the most efficient manner so as to achieve the desired profits. The milking process involves several steps, which help obtain adequate milk let-down. Besides, these steps help in efficient milk harvesting and minimising chances of mastitis in animals. This Unit discusses milk let-down mechanism, different methods of milking, clean milk production, etc.



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SESSION 1: STRUCTURE OF THE UDDER, MILK LET-DOWN AND MILKING OF DAIRY ANIMALS

Structure of the udder

It is essential for a dairy farmer to understand the physiology of a dairy animal and the processes that help in milk secretion. Therefore, it is necessary to understand the functional aspects of the udder and the connected organs.

Milk is produced by a network of glands grouped together in the udder of cows and buffaloes. The mammary glands or udder is the modified sweat gland. The udder is,

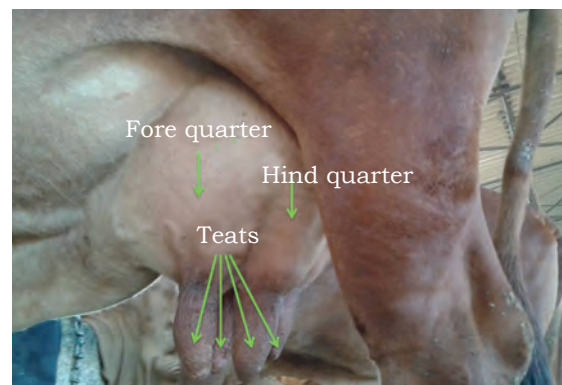


Fig. 3.1: Parts of the udder

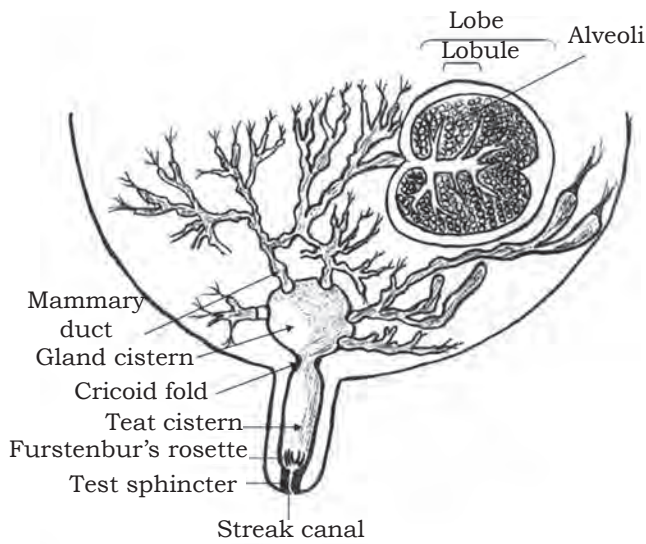


Fig. 3.2(a): Internal structure of the mammary gland

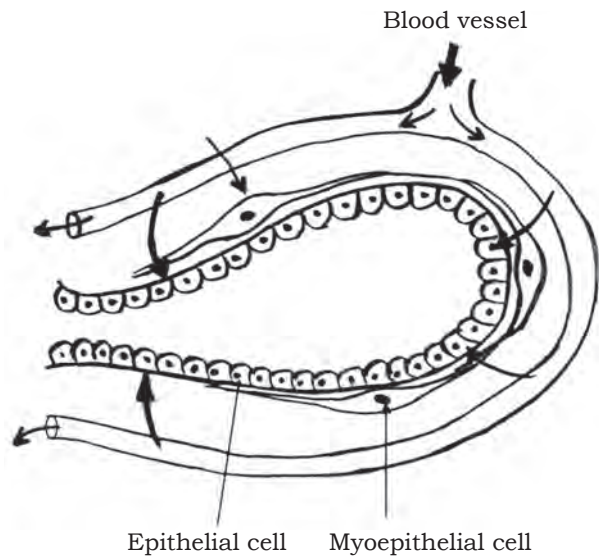


Fig. 3.2(b): Enlarged image of alveoli

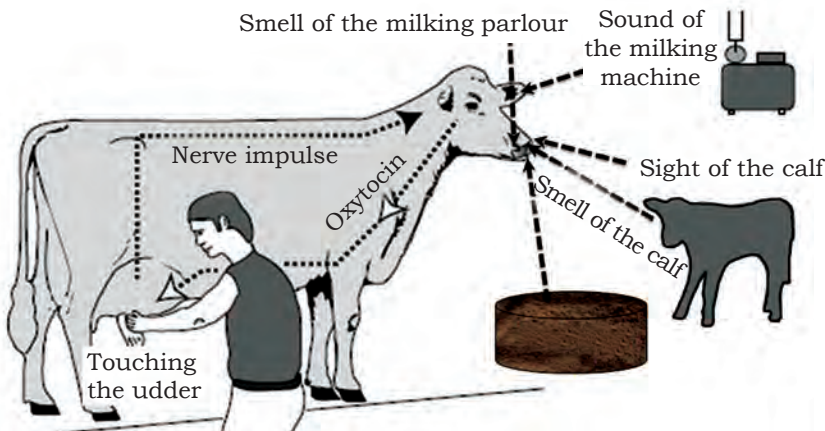


Fig. 3.3: Various stimuli that initiate milk let-down reflex

usually, covered with fine hair but the teats do not have hair. The udder of cows and buffaloes has four quarters with one teat hanging from each quarter (Fig. 3.1). Each quarter acts as an independent unit. The two fore quarters are smaller than the two hind quarters. The fore quarters contain less secretory tissues than the hind

quarters. Therefore, the fore quarters produce about 40 per cent of the total milk, while the hind quarters produce 60 per cent.

Physiology and process of milk let-down

Milk let-down occurs because of a combination of various neural and hormonal actions in an animal. The milk let-down reflex starts with the activation of nerves, mediated by the brain of the animal. A single stimulus or a combination of the following external stimuli may initiate milk let-down reflex (Fig. 3.4).



- Physical touch like suckling by the calf, washing the udder (which is sensitive to touch and temperature), putting on the milking machine or massage of the udder by the milker
- The sight of the calf (especially, in indigenous cows) and approach of the milker
- The sound of milking machine and rattling of milk buckets
- The smell of milking parlour, calf, feed, etc.
- Feeding concentrates to the animal



Fig. 3.4: Suckling by a calf prior to hand milking results in milk let-down.

These stimuli send signals to the animal's posterior pituitary, a gland at the base of the brain that releases oxytocin in blood. The action of oxytocin lasts only for six to eight minutes because its concentration in blood decreases rapidly. This means that milking must be completed within this period.

Hindrances in milk let-down

In certain situations, the milk ejection reflex can be inhibited. Certain stimuli, such as rough handling of the animal, loud and unfamiliar noise, pain, irritation and fear cause release of 'adrenalin', a stress hormone that hinders milk let-down. Therefore, cows and buffaloes must be handled gently, and milked carefully at regular intervals. Milking must be a pleasant experience for the animal so that it is able to eject milk fully.

Pre-milking activities

Preparing the milking area

The milking area must be cleaned regularly, preferably with a disinfectant, before and after milking. The area must be made free from flies and insects. Loud noise or any other kind of disturbance during milking may cause stress to the animals or scare them, which may lead to reduced yield.

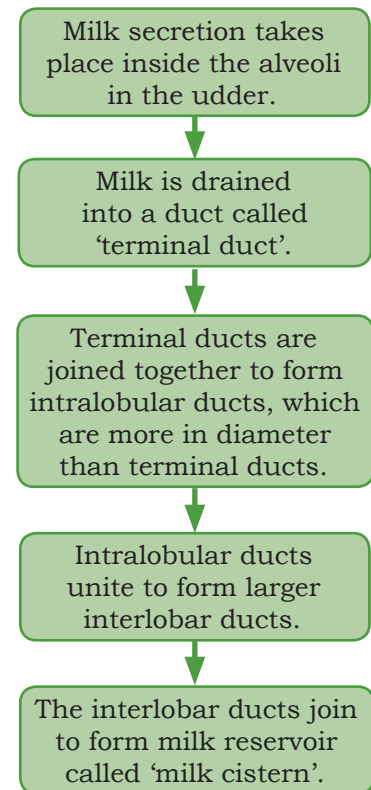


Fig. 3.5: The process of milk secretion in the udder



Fig. 3.6: Wash the animals before milking.



Fig. 3.7: Use a rope at the time of milking.



Fig. 3.8(a): Wash the udder with lukewarm water.



Fig. 3.8(b): Use potassium permanganate solution (0.001%) mixed in water to wash the udder.



Fig. 3.9: Wipe the udder with a clean paper towel or cloth.

Preparing the animal

The animal can be conditioned for milk let-down reflex by:

- brushing or bathing it before milking as this removes dirt from the animal's body, which may accidentally fall into the milk (Fig. 3.6).
- following a milking schedule.
- offering concentrate mixture to it at the time of milking (one of the best stimuli for milk let-down).
- using an anti-kicker or milkman's rope to eliminate chances of kicking (by heifers) at the time of milking. If a heifer is groomed and handled appropriately, kicking can be averted (Fig. 3.7).

Disinfecting the udder and teats

The udder and teats must be washed with lukewarm water [Fig. 3.8(a)] or by mixing 0.001 per cent potassium permanganate solution in water [Fig. 3.8(b)]. After washing, the udder and teats need to be dried with a paper towel or cloth (Fig. 3.9).

Preparing the milker, milking pail and milking shed

The nails of the milker (a person who milks cows and buffaloes) must be cut. The person must wash one's hands with an anti-bacterial



soap before milking. The milking pail must be washed with a detergent. The milking shed must also be cleaned with water and disinfectant, and be made free from flies and insects.

Milking

Clean milk production is the primary goal of a dairy farmer. A milking method must ensure compliance of the following.

- Discarding initial few streams of milk as it carries bacterial load
- Production of dirt-free milk
- Causing no injury to the animal's udder or teats
- Prevention of transfer of mastitis causing organisms from the environment
- Efficient use of labour and equipment

Methods of milking

Hand milking

Milking by hand is the traditional way to draw milk from lactating animals for human consumption. In this method, it is common to apply restricted suckling, where a calf is used for initiating milk ejection reflex. The calf is allowed to suckle after milking. Dairy animals are, usually, milked from the left side. Hand milking is most commonly practised in India and other developing countries, where labour is cheap and readily available. Low to medium yielding animals are suitable for hand milking. Milking, ideally, needs to be completed approximately within 7–8 minutes. However, it may take longer. High yielding animals are not suitable for hand milking as it cannot be completed within eight minutes in them. In hand milking, two methods are, generally, practised — full hand milking and stripping. Knuckling is also a hand milking method but a faulty one.

Full hand milking

It is the best method of milking and most suited for animals having big teats. This method is similar to the calf's suckling style. The method starts with holding

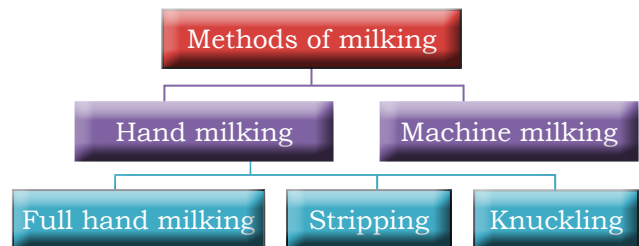


Fig. 3.10: Methods of milking





Fig. 3.11: Full hand milking

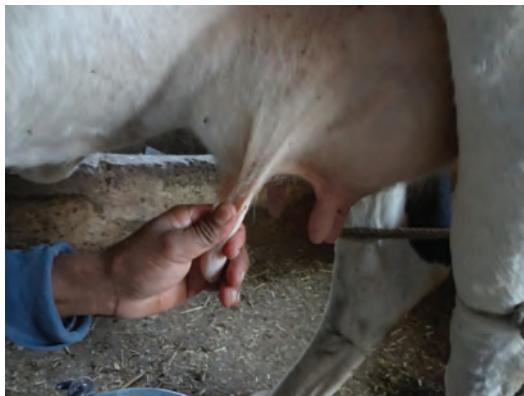


Fig. 3.12: Stripping



Fig. 3.13: Knuckling

the teats in the hand and fingers encircling them. The base of a teat is blocked by the fore finger and thumb forming a ring. Milk is trapped in a teat cistern and may not return to the gland cistern. Concurrently, the teat is squeezed between the middle, ring and little fingers, and the hollow palm, thereby, forcing milk to come out of the sphincter (Fig. 3.11). Immediately after the squeeze, there will be complete relaxation of the teat to draw more milk in the teat cistern. However, the position of the hand over the teat remains the same. Alternate compression and relaxation of two teats (by using both the hands) is done in quick succession to draw milk at a fast pace so that it comes out in the form of a continuous stream.

Stripping

Stripping is preferred, where the teats of an animal are small in size. In this method, a teat is squeezed firmly at the base with the thumb and fore finger. Then, the teat is pulled down the entire length and pressed simultaneously to cause the milk to flow down in a stream (Fig. 3.12). Both the hands are used to milk two teats at the same time but they, usually, strip alternate ways. The process is repeated in quick succession. This may sometimes cause discomfort to the animal. As stripping requires changing the hand position each time, it is more time taking than full hand milking.

Knuckling

It is a faulty method of hand milking (Fig. 3.13). The milker bends the thumb against a teat. Chances of injury to the teats are high in this method. The teats often get swollen during knuckling. Sometimes, they may even get completely blocked.





Fig. 3.14(a): A mobile automatic milking machine



Fig. 3.14(b): A cow being milked with the help of a machine

Machine milking

It refers to the process of harvesting milk from the udder of dairy animals using a milking machine [Fig. 3.14 (a) and (b)]. Increase in labour costs has led to the use of milking machines, especially, in developed countries. It reduces the hard work that goes into hand milking.

Table 3.1: Parts of milking machine and their functions

Parts	Functions
Vacuum pump	It creates vacuum by sucking out air from the system (consisting of pipes, receivers, etc.) to generate negative pressure in the teats.
Teat cups (four)	These collect milk when the teats are exposed to vacuum.
Claw	It collects milk from all teat cups.
Pulsator	It is an air valve that creates 'pulsation' or opening and closing of the liner. Teat cups are attached with rubber liners from the inside. When vacuum is created, the liner gets pulled open around the teat and milk starts flowing because of that vacuum.
Connecting tubes	
Short milk tube	It helps draw milk from the soft rubber liner to claw, which is mostly transparent.
Long milk tube	It helps draw milk from the claw to the milk bucket or milk line, which is often transparent.
Short pulse tube	It carries air from the shell to the air fork and vice versa to produce the required pulsation. The tube is often dark coloured.
Long pulse tube	It carries air from the air fork to the pulsator and vice versa to produce the required pulsation. It is often dark coloured.

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Principle of machine milking

The principle of machine milking is to draw milk from the udder of a cow or buffalo by applying vacuum. Machines are designed to apply constant vacuum to the end of a teat to draw milk and transfer it to a container, and give periodic squeezes to the teat to maintain blood circulation.

How does a milking machine work

The double-chambered teat cup and pulsator create vacuum (milking phase) and atmospheric pressure (massage phase) in the teats on an alternate basis. When air is removed from the pulsation chamber (area between the shell and liner or inflation), the liner opens as the pressure inside the chamber and vacuum line are same. The vacuum at the end of the teat forces milk to come out of the teat cistern into the liner. However, when air is trapped inside the pulsation chamber, the liner collapses beneath the teat as the pressure inside it is lower than the pulsation chamber. During this period of 'rest', the teat canal closes but not the teat cistern. As a result, milk flow stops and body fluids that were 'aspirated' in the tissue of the teat may leave. This massaging action of the teat cup during the pulsation cycle prevents fluid congestion and oedema.

Difference among hand and machine milking, and suckling

The basic processes behind hand milking, machine milking and suckling by calves are different as depicted in Table 3.2. The calf can suckle more milk per unit time than a milking machine as it applies both negative and positive pressure.

Table 3.2: Milk removal by various methods

Hand milking	Machine milking	Suckling
<ul style="list-style-type: none">• Uses positive pressure• Slow process	<ul style="list-style-type: none">• Uses negative pressure• Fast process	<ul style="list-style-type: none">• Uses both positive and negative pressure• Fastest process



Post-milking activities

Teat dipping

The streak canal in a teats stays open for about an hour after milking. If the teats of a cow or buffalo come in contact with mastitis causing pathogens during this period, they may easily enter the animal's body and cause infection(s). One of the most effective methods of checking mastitis is dipping the teats into a germicide solution post-milking. This prevents the entry of organisms through the teat ends. It leaves a film on the teats, providing a barrier for ensuring longer protection, until the teat sphincter closes after milking. It is different from pre-dipping. Teat dipping does not control or eradicate an existing infection. However, the rate of new infection can be reduced by up to 50 per cent.

Storage and transportation of milk

Milk must be always stored and transported in clean containers having their lids on. It must be kept in a cool and shady place (4 °C). It must reach the milk collection centre within two to three hours after milking and refrigerated.

Cleaning milking utensils

Milking areas and utensils must be cleaned to avoid contamination of milk. Fig. 3.15 depicts the process of cleaning milking utensils. It must be noted that milk obtained from sick animals is not suitable for consumption. Equipment and utensils used for milking such animals must be cleaned immediately and thoroughly to check cross-contamination.

Factors affecting milk composition and production

Milk yield is the main factor that determines profitability for a farmer. The price of milk is, usually, determined by its composition. The major components of milk are water, fat, protein, lactose and minerals. Among these, fat, usually, shows the maximum variation and lactose the least. The colour of milk is yellowish as in case of

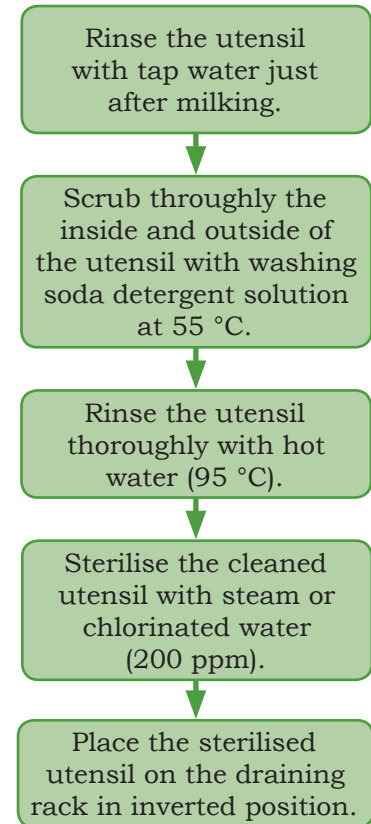


Fig. 3.15: Process of cleaning milking utensils

Table 3.3: Summary of the milking process

Pre-milking activity	Milking activity	Post-milking activity
<ul style="list-style-type: none"> • Clean the milking area or parlour with water and disinfectant. • Clean or wash the animal, and its udder and teats. • Take the animal to the milking area. • Rinse the utensils and machine or equipment required for milking with water. • Offer concentrate feed to the animal. • Prepare the udder for milking. • Strip and discard the fore milk. 	<ul style="list-style-type: none"> • Milk the animal either by machine or hand. 	<ul style="list-style-type: none"> • First, apply post-milking teat dip. • Transfer the milk drawn into a storing can having a lid. • Store the milk at 4 °C. • Take back the animal to the shed. • Clean the milking area or parlour with water and disinfectant. • Wash the milking machine and utensil(s) using water and detergent.

cows and creamy white in case of buffaloes. The colour of buffalo milk is due to the presence of calcium caseinate. Buffalo metabolises all carotene present in the feed into vitamin A, which is passed into its milk, whereas, cows cannot metabolise carotene. Cow milk is from opaque to yellowish in colour due to the presence of beta-carotene. A number of factors influence the quantity and quality of milk. These are broadly classified into genetic, physiological, temperature, humidity, feeds and feeding, and management practices.

Milk yield is largely determined by genetic and nutritional factors, although there are other factors, too, that affect milk yield and its quality.

Genetic

Milk quantity and quality are affected by both genetic, as well as, environmental factors.

Species

There is a wide variation in milk quality and quantity among different species and breeds. On an average, an Indian buffalo yields more milk than an average Indian cow. Goats and sheep yield less milk compared to cows and buffaloes. The composition of milk of different species is shown in Table 3.4.

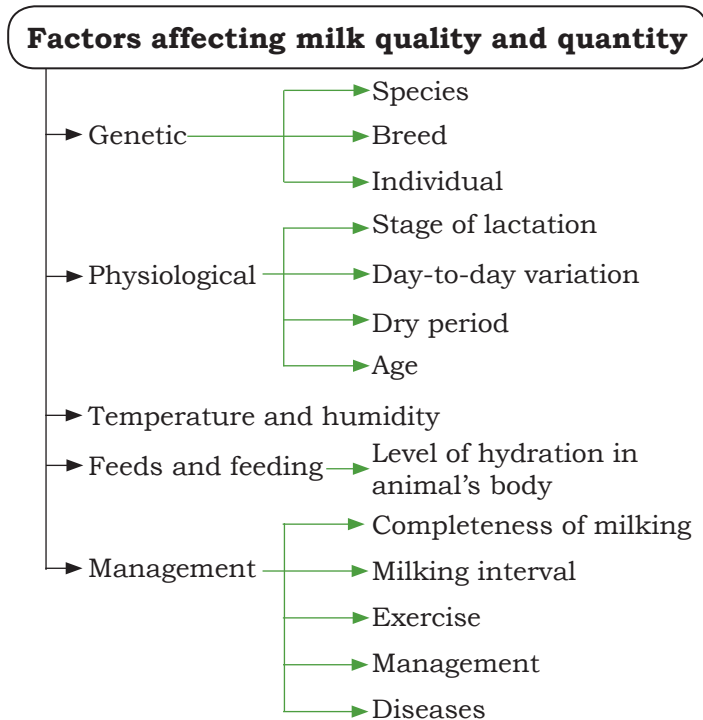


Fig. 3.16: Various factors influencing milk quality and quantity



Breed

High yielding cows produce milk with low fat content. The composition of milk produced by individual cows of a particular breed may differ greatly (Table 3.5). Jersey cows produce milk having about 5 per cent fat content, while the milk of Holstein–Friesian contains about 3.5 per cent fat. Zebu cow’s milk contains up to 5.5 per cent fat.

Table 3.4: Milk composition of various farm animals

Species	Fat (%)	Protein (%)	Lactose (%)	Ash (%)	Total solids (%)
Buffalo	5–8	3.8–4.3	4.9	0.78	17
Cow	3.2–5	3.2–4	4.9	0.72	13.9
Sheep	3–5.5	3.5–5.5	4.6	0.9	16.3
Goat	3–5.5	3.1–3.7	4.6	0.79	12

Table 3.5: Cow and buffalo breeds, and fat content in their milk

Cow and buffalo breeds	Yield (kg)	Fat (%)
Exotic cows (<i>Bos taurus</i>)		
Holstein–Friesian	4,200–4,633	3.3–4.1
Jersey	3,548–4,105	4.9–5.5
Indian cows (<i>Bos indicus</i>)		
<i>Sahiwal</i>	1,548–2,283	4.6–5.1
<i>Red Sindhi</i>	1,514–1,634	4.9–5.2
<i>Gir</i>	1,312–1,804	4.7–5.0
<i>Tharparkar</i>	1,456–2,177	4.6–4.9
<i>Hariana</i>	721–1,436	4.4–4.8
Buffalo (<i>Bubalus bubalis</i>)		
<i>Murrah</i>	1,031–2,565	5.5–7.2
<i>Nili Ravi</i>	1,586–1,955	6.5–7
<i>Surti</i>	1,086–2,015	6.3–8.1
<i>Bhadawari</i>	1,110–1,252	8–12

Physiological

Stage of lactation

Milk production and its composition change during the normal course of lactation. Milk production in cows and buffaloes increases after calving and reaches its peak during the second month of lactation. It decreases



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gradually as lactation progresses. The rate of change in milk production between two intervals is called 'persistence of milk yield'.

Low persistency at any stage of lactation may be caused because of environmental, reproductive or health related factors like reduced feed intake due to estrus, infections, changes in management, ration or weather. Changes in milk yield persistency may also be due to changes in herd social interactions, resulting from regrouping or introduction of new animals, metabolic and digestive disorders and mastitis. Consistently low post-peak persistency in individual cows and buffaloes or a lactation group are commonly due to inadequate nutrition.

Milk fat percentage decreases during the first three months after calving. It remains constant for the next three months. After five to six months at the end of the lactation period, noticeable increase in fat content is witnessed. Milk protein content, gradually, increases with advancing lactation. Lactose and mineral concentration increase slightly during advancing lactation.

Day-to-day variation

Day-to-day variation in milk yield and composition are common in dairy animals. When an animal is in heat, the yield may temporarily decrease for a day or two, which is primarily due to increased physical activity and lowered feed intake.

Dry period

A dry period of 60 days between two lactations is essential for optimum milk production. Cows and buffaloes denied dry period will yield less milk in subsequent lactation than others.

Temperature and humidity

Milk production drops significantly when the temperature rises above 30 °C. Heat stress adversely affects dairy animals and is harmful during peak production period. High humidity adversely affects production only when the temperature exceeds 24 °C. Lowered appetite due to high temperature and humidity is the primary cause of reduced milk yield.



Feed and feeding

For optimal milk production, the feed must contain sufficient energy, protein, crude fibre, vitamins and minerals. Cows and buffaloes produce approximately half of their total milk yield during the first 100 days of lactation. Therefore, it is essential to feed them at short intervals during the early days of lactation. Feed intake is poor at the beginning of lactation but improves gradually. As the feed intake is not proportional to milk production requirements, cows and buffaloes utilise their body reserves for milk production. Therefore, a lactating cow or buffalo, usually, loses weight in the beginning of lactation. Even under conducive feeding conditions, cows and buffaloes can lose as much as 66 kg of body mass during the first three months of lactation. From 120 days after calving, the body mass of the animal gradually increases until calving.

Feed quality affects the composition of milk. A change in the diet of the animal changes the composition of milk.

Change in milk fat percentage

Acetic acid, a volatile fatty acid produced in the rumen, affects milk fat content. Feed, which favours the production of Acetic acid, causes an increase in milk fat percentage. On the other hand, feed lowering Acetic acid production causes a decrease in milk fat percentage. Rations reducing fat percentage are based on high level of concentrate, pelleted feed, finely ground hay, lush pasture grasses, low level of roughage, etc. Vegetable oil and adequate amount of fibre can be added to the ration (17–18 per cent) to improve the milk fat percentage.

Changes in protein and Solid Not Fat (SNF)

When the animal is underfed, there is reduced milk production. Besides, the milk has low protein and fat content.

Management

Completeness of milking

Fat content differs significantly in the first and last milk. Fat percentage is almost five times higher in the



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last milk (7–9 per cent) as compared to the first milk (1–2 per cent). Therefore, if a cow or buffalo is not milked fully, some of the fat remains in the udder. Hence, the overall milk fat percentage will be low. Optimal milking time for most cows and buffaloes is just over five minutes to achieve maximum milk ejection. An inefficient milker is not able to milk a cow or buffalo completely. This affects the milk flow, and therefore, the milk fat content. Incomplete milking occurs when the cow or buffalo is upset during the milking process. Leaving more residual milk in the udder for few consecutive days permanently reduces the yield for the entire lactation period.

Milking interval

Milking thrice a day increases production by 10–25 per cent than twice a day. Milking four times a day further increases production by 5–15 per cent. In case of uneven milking intervals, cows and buffaloes produce less milk after a short interval but this milk will have a higher fat content compared to milking the animals thrice a day. However, when they are milked twice a day at regular intervals, there will be little difference between the fat percentage and milk production at different milking times. Usually, the yield in the morning is little more with a slightly lower fat percentage. When the animals are milked three or four times a day, the milk yielded in the middle of the day will contain a little more fat content as compared to the morning.

Care and supervision

High yielding cows and buffaloes are, usually, looped tightly with a rope. Excitement causes a decrease in milk production. Supervision before and during milking is essential for optimal production. Cows and buffaloes must never be taken for milking in a hurry. Regularity must be maintained in milking and feeding schedules. It must be ensured that cows and buffaloes are milked completely. Incomplete milking occurs when milkers are inefficient or the milking machine hurts the animal. This can even cause mastitis through inflammation.



Diseases

Diseases adversely affect both milk production and its composition. Diseases, such as mastitis, ketosis, milk fever and digestive disturbances, can cause a decrease in the yield. Clinical mastitis causes 10 per cent decrease in production. In case of mastitis, fat and SNF content decrease, while there is an increase in protein and chloride.

Practical Exercise

Activity

Observe pre-milking activity in a dairy farm and discuss the process being followed there in class.

Material required: writing material

Procedure

- Visit a dairy farm in your locality.
- Note down the milking schedule being followed there.
- Note down the various steps being followed there before milking.
- Present your observations before the class.

Check Your Progress**A. Multiple Choice Questions**

1. What kind of pressure is applied on the teat end in machine milking?

(a) Positive pressure	(b) Negative pressure
(c) Both (a) and (b)	(d) None of the above
2. Milk must be stored in clean containers with the lid on and kept at what temperature?

(a) -4°C	(b) 0°C
(c) 4°C	(d) 10°C
3. Which of the following stimuli initiates milk let-down reflex in a dairy animal?

(a) Washing the udder	(b) Sight of a calf
(c) Smell of a calf	(d) All of the above
4. Which of these ensure an efficient milking method?

(a) Removal of maximum milk quantity
(b) Production of dirt-free milk
(c) Efficient use of labour and equipment
(d) All of the above
5. Which of the following statements about knuckling is not true?

(a) Fast milking method
(b) Milker bends the hand against the teat
(c) Chances of injury to the teats are high
(d) Faulty method of milking



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B. Fill in the Blanks

1. Mammary glands or udder is a modified _____ gland.
2. Milk let-down is the result of a combination of neural and _____ actions in the animal body.
3. Secretion of _____ causes inhibition of milk ejection despite the release of oxytocin.
4. Dairy animals are, usually, milked from the _____ side.
5. The action of oxytocin only lasts for _____ minutes because its concentration in the blood decreases rapidly.

C. Mark 'True' or 'False'

1. Kicking can be eliminated, if a pregnant heifer is groomed and handled carefully.
2. The size of the two fore quarters is larger than the two hind quarters.
3. The basic principle of milking machine is to draw milk from a teat through the application of positive pressure at the teat end.
4. A loud noise or any kind of disturbance during milking can cause stress to animals, which may lead to reduced milk yield.
5. Teat dipping does not reduce an existing infection.

D. Match the Columns

A	B
1. Milker	(a) Buffalo milk
2. Milking shed	(b) Cow milk
3. Creamy white	(c) Anti-cow kicker
4. Yellowish	(d) Person who milks animals
5. Kicking	(e) Where milking is done

E. Crossword

		¹ L					² S	
							T	
							R	
		W	³ S			⁴ M		
						I	P	
⁵ A		R		N			I	N
		M	A			K		
			T				G	



Across

5. It is a hormone that inhibits milk let-down in cows and buffaloes.

Down

1. Before milking, the udder and teats must be washed with _____ water.
2. _____ milking method is preferred where the teats of an animal are small.
3. Mammary glands or udder is a modified _____ gland.
4. The primary goal of a dairy farm is to produce _____.

SESSION 2: CLEAN MILK PRODUCTION AND PREVENTION OF MASTITIS IN DAIRY ANIMALS

Sources of milk contamination

Milk is considered to be the most nutritious food. It remains in sterile condition while in the udder of a healthy animal. It becomes contaminated only during milking, cooling, storage, transportation and processing. Post-milking contamination may be due to handling the udder or milk with contaminated hands. Milk serves as a medium for the growth of bacteria, yeast and moulds. Their rapid growth, particularly, at high ambient temperatures can spoil the milk, making it unfit for consumption. This, in the long run, adversely affects the manufacturing of other dairy products. Some of the sources of milk contamination are as follows.

- Infected animal
- Unclean udder
- Unclean coat of the animal
- Unclean hands of the milker and milk handler
- Contaminated drinking water
- Unhygienic shed and surroundings
- Unclean milking equipment
- Air-borne contamination

Clean milk production

This implies milking healthy animals in hygienic conditions. Therefore, the milk is free from dust, dirt,



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flies, manure, etc. Clean milk has normal composition, possesses natural flavour, contains small amount of harmless bacteria, is free from hazardous chemical residues, and hence, safe for human consumption. It is collected in clean dry milking pails. The aim of dairy farmers is to maximise the yield.

Some of the advantages of clean milk production are as follows.

- The milk is free from disease causing organisms.
- It ensures better quality of processed milk products.
- Raw milk can be stored unprocessed for three to four hours at room temperature.
- The milk is safe for long distance transportation.
- It is suitable for human consumption.

Importance of healthy animal in clean milk production

The animal itself is one of the most important sources of milk contamination. A healthy animal is foremost for ensuring clean milk production. The animal must be yearly checked for tuberculosis, brucellosis and other contagious diseases. If it is suffering from infections, such as mastitis, its milk will contain harmful pathogenic microorganisms. Milk produced from diseased animals must be kept separately and disposed of safely.

The animal's coat serves as a large surface for contamination. Dung, urine, uterine discharge, dirt, dust and hair can drop from the animal's skin and udder into the milk, thereby, passing infections or disease causing bacteria into the milk and contaminating it. Long hair on the flanks, hind legs, tail and udder must be trimmed at frequent intervals. Regular grooming of the animal can help check hair and dirt in the milk.

Cleaning of animal shed and surroundings

It is important to keep the animals clean and maintain hygiene in sheds. Their dung must be disposed of immediately, and arrangements for the drainage of dung, urine and wastewater be made. The manure pit must be about 15 metre away from a shed to prevent



insects and flies from entering the area. Flies carry as many as 1.25 million bacteria. They carry bacteria that may cause typhoid, dysentery and other contagious diseases like tuberculosis, E. Coli, brucella, salmonella, etc. The milking barn must have a concrete and non-slippery floor that is easy to clean. Before milking the animals, the sheds must be cleaned with water and a disinfectant, and dried. It must be cleaned in a similar way after milking too.

Healthy milkers and milk handlers

Milkers and milk handlers need to be healthy. Their hands must be clean, and free from cuts and sores. A milker must always wash one's hands with water and an anti-bacterial soap before handling milk. The person must wear clean clothes, gloves and gumboots while handling milk. Those suffering from communicable diseases or having an open sore or wound on the arms, hands, head or neck must not handle milk. Coughing or sneezing near milk or milk containers must be avoided. Smoking during milking is prohibited. If the milker suffers from tuberculosis, salmonella, dysentery or any other disease, the risk of milk contamination increases.

Milking sequence

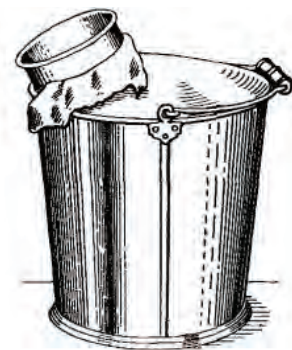
During milking, there are chances of transmission of diseases to dairy animals. To reduce such conditions, the animals must be milked in a sequential manner, which is as follows.

First calver → other healthy cows → sick cows

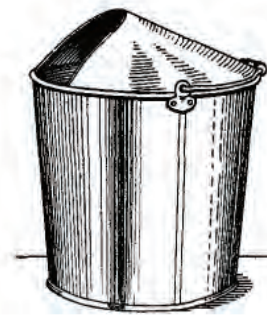
Sick animals must always be milked in the end. Then, the milking system (consisting of a milking machine, bucket or container used for storing milk) must be washed and sterilised.

Types of milking pail

Milking pails having a dome-shaped top instead of open buckets or vessels must be used for milking [Fig. 3.17 (a and b)].



(a)



(b)

Fig. 3.17 (a and b): Dome-shaped milking pails



Fig. 3.18: A milk strainer



Fig. 3.19: Aluminium cans for temporary storage of milk

Discard the foremilk

It is important to test the foremilk at each milking with a strip cup to identify cows and buffaloes suffering from clinical mastitis. Remove 2–3 squirts of the foremilk and examine with strip cup test. The milk of an animal diagnosed with mastitis is, usually, discoloured, watery and contains flakes or clots. Foremilk samples must be discarded as they have high bacteria content.

Storage and transportation

Always use a clean strainer to strain milk (Fig. 3.18) and store it in a seamless clean container. An aluminium container (Fig. 3.19) is commonly used for this purpose. Milk is sensitive to light. If exposed to direct sunlight, butterfat and some vitamins present in the milk get oxidised, and it develops a foul and oxidised taste. The containers must have a lid on, and be kept in a cool (4 °C) and shady place to check bacterial growth. Transport the milk as early as possible in clean containers within minimum transportation time. When continuously stirred or disturbed, the milk fat gets destabilised and it tends to oxidise easily, spoiling the taste. It must reach the milk collection centre, ideally within 2–3 hours after milking.

Mastitis in dairy animals

Mastitis is a disease caused in dairy animals by bacterial agents. Bacterial organisms invade the udder, multiply and produce harmful substances, causing inflammation. It causes reduction in the yield and alters milk composition. In mastitis, inflammation of the mammary gland is caused by bacterial infection, trauma or injury to the udder. Mastitis causes maximum losses to dairy farmers. Some of these losses are as follows.

- Discarding of milk
- Reduced milk production
- Additional treatment cost
- Damage to infected mammary gland
- Culling of animals

Mastitis is classified into clinical and sub-clinical, depending on the degree of inflammation in the mammary gland of dairy animals.



Clinical mastitis

This is characterised by abnormalities in the milk or udder. The udder is hot and swollen. The most obvious abnormalities in the milk are flakes and clots. Besides, the milk may have a watery appearance. Watery milk may emit a foul smell.

Sub-clinical mastitis

This is characterised by inflammation of the mammary gland that does not create visible changes in the milk or udder. Although the milk appears normal, dairy animals with sub-clinical mastitis yield less milk, and the quality, too, is not up to the mark. In addition, infected animals may be a source of infection for other animals in the herd.

Mastitis detection methods

California Mastitis Test (CMT) or paddle test

It is a simple, inexpensive and rapid screening test for detecting mastitis in dairy animals (Fig. 3.20 and 3.21). The test is based on the amount of cellular nuclear protein present in an animal's milk sample. CMT indicates severity of the infection.

Strip cup test

Strip cup is an instrument made of plastic, stainless steel or aluminium. Strip cup test is relatively inexpensive than other mastitis diagnosis methods. It is, therefore, beneficial that the farmers make strip cups themselves.

Collection of milk sample for culture test

For culturing, milk needs to be collected from each of the four quarters of the udder, separately. Milk culturing can be done on a farm and the samples be sent to a laboratory for testing or analysis.

Control and prevention of mastitis

Mastitis cannot be eradicated but controlled by efficient management of the animals. A number of steps are followed to control the occurrence of mastitis in dairy animals.



Fig. 3.20: Empty the strip cups for CMT for four corresponding teats.



Fig. 3.21: Gel formation indicates the presence of mastitis in corresponding teat after addition of CMT reagent to the milk.

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Hygienic environment

Keeping cows and buffaloes clean is essential for controlling mastitis. Chances of udder and skin infection increase rapidly if the animals are kept in unhygienic conditions. Therefore, they must be provided with a clean and stress-free environment. Their teats must be washed with lukewarm water or by mixing 0.001 per cent potassium permanganate solution in water.

Dry cow therapy

The udder of the cow or buffalo requires a non-lactating or rest period prior to calving in order to optimise milk production in subsequent lactation. This phase of the lactation cycle is commonly referred to as 'dry period'. Dry cow therapy at the end of lactation is a standard part of mastitis control programme in a dairy farm. This therapy treats existing infections in the udder and prevents the occurrence of new infections in the area. Administering long-acting intramammary antibiotics to all quarters of the animal after the last milking or lactation is a key step in dry cow mastitis control therapy.

Treating clinically infected animals

Early detection of clinical mastitis is important. This can be done by strip cup test or CMT. On the basis of the test, the veterinarian decides whether antibiotic infusions are required. Once the infusions begin, complete the course of treatment as directed by the veterinarian. The milk of such an animal is unfit for consumption till it is cured or the disease is in control. Follow the veterinarian's advice as it might be helpful for the animals and even in carrying out laboratory tests.

Applying Somatic Cell Count

Somatic cell count (SCC) must be done every month to monitor the health status of a herd. SCC of milk from a healthy mammary gland is, usually, less than 2 lakh/ml. SCC above 2 lakh/ml indicates bacterial infection and



sub-clinical mastitis. Sub-clinical mastitis affects milk quality (as regards to its composition) and production.

Culling of animals

This is a vital part of mastitis control programme. Culling is the process of removing unproductive animals from a herd based on symptoms like reduced milk yield, reduced growth, infertility, incurable diseases, etc., and keeping them separately. The treatment and retention of chronically infected cows and buffaloes is a threat to the production of quality milk. Cows and buffaloes that do not respond favourably to treatment and continue to flare-up clinical mastitis need to be culled promptly. Their continued presence in the herd may transmit infections to other animals in the farm.

Milk withdrawal period

It is important to observe the recommended withdrawal periods for milk, following treatment against mastitis. When clinical mastitis is treated with antibiotics, milk containing drug residues may adversely affect people with allergies and also cause antibiotic resistance in them. The milk must be discarded on treatment days and withholding period. In general, it is assumed that milk will be discarded for six days — three days of treatment and three days of withholding period.

Practical Exercise

Activity

Visit a dairy farm and write down the steps of clean milk production being followed there.

Material required: writing material.

Procedure

- Visit a nearby dairy farm.
- Observe the milking of dairy animals there.
- Note down the steps being followed to draw milk.
- Also, write down about the utensil in which the milk is being drawn.
- Present your findings before the class.



Check Your Progress

A. Multiple Choice Questions

- Milk is not contaminated in _____ stage.
 - milking
 - transportation and processing
 - cooling
 - None of the above
- Which of the following about clean milk is true?
 - Normal composition
 - Possesses natural milk flavour
 - Contains only a small number of harmless bacteria
 - All of the above
- Which of the following conditions is true for clean milk production?
 - Trimming long hair on the flanks of the animal
 - Clipping the animal's tail
 - Grooming
 - All of the above
- Foremilk samples must be discarded as they _____.
 - have high fat content
 - have high bacteria count
 - are sour in taste
 - None of the above

B. Fill in the Blanks

- _____ cows must be milked in the end.
- _____ animals regularly can help keep hair and dirt away from the milk.
- _____ milk is, usually, discoloured, watery and contains flakes or clots.
- Milk from _____ animals must be kept separately and disposed of safely.

C. Mark 'True' or 'False'

- A milking pail must have a dome-shaped top.
- Milk is not sensitive to light.
- Clean milk is free from dust, dirt, flies, manure, etc.
- When shaken vigorously, milk fat gets destabilised and tends to oxidise easily, spoiling the taste.
- A dairy animal must be checked yearly for tuberculosis, brucellosis and other contagious diseases.



D. Match the Columns

A

1. Culling
2. Milk withdrawal period
3. Dry cow therapy
4. Milk storage
5. SCC

B

- (a) Discarding of milk
- (b) End of lactation
- (c) 4 °C temperature
- (d) Sub-clinical mastitis
- (e) Process of removing unproductive animals from herd

E. Crossword

	¹ F			² S				
³ D		M	E					
⁴ G		O		M			G	
	⁵ M		S				I	S
				I				
	L			C				
	K							

Across

3. This is the ideal shape of a milking pail.
4. Regularly following this process can help keep hair and dirt away from milk.
5. This is the maximum loss causing disease for dairy farm.

Down

1. _____ samples should be discarded as they have high bacteria count.
2. _____ cell count is an indicator of mastitis.



Unit

4



Maintaining Health and Safety Standards at the Workplace



171209CH04

INTRODUCTION

Dairy farming is a labour-intensive and time-consuming job. Various kinds of risk are involved while carrying out routine farm operations. The risks are related with handling of animals and equipment, and transmission of diseases from animal to animal, animals to humans and vice versa. An animal may suffer from various diseases and infections. This necessitates a dairy farmer to have knowledge of some first aid measures that may help save the life of the animal and also reduce its pain, thereby, preventing its condition from deteriorating further and aiding to its speedy recovery. The dairy farmer, therefore, needs to understand the biosecurity measures that must be adopted in a dairy farm. This Unit deals with the health and safety measures that need to be adopted in a dairy farm.

SESSION 1: HYGIENE AND BIOSECURITY IN A DAIRY FARM, AND DISPOSAL OF CARCASS

Cleanliness and hygiene in a dairy farm

Cleanliness refers to the removal dirt and debris, whereas, hygiene can have a broader meaning. In dairy farming, particularly, when livestock are raised in

confinement, cleanliness is of utmost importance for their health. However, it is not the sole factor. The focus is also on the floor of the shed, milking equipment, surroundings, etc. Cleanliness and hygiene are directly related to Somatic Cell Count (SCC) present in milk.



Fig. 4.1: A clean animal shed

Safe handling of equipment and animals

The different kinds of risk involved in dairy farm operations are depicted in Fig. 4.2. Prior to performing manual jobs, assess the risks and follow the recommended safe practices.

- Plan and design work surfaces for safe and comfortable working.
- Store objects for regular use safely in easily accessible areas.
- Move large and heavy equipment carefully using lifts, trolleys, etc.
- Keep yards, housing and milking areas clean and dry to avoid tripping and slipping.
- Ensure that the gates open smoothly.
- Avoid slippery surfaces while handling and moving animals.
- Do not wear slippery footwear in the work area.

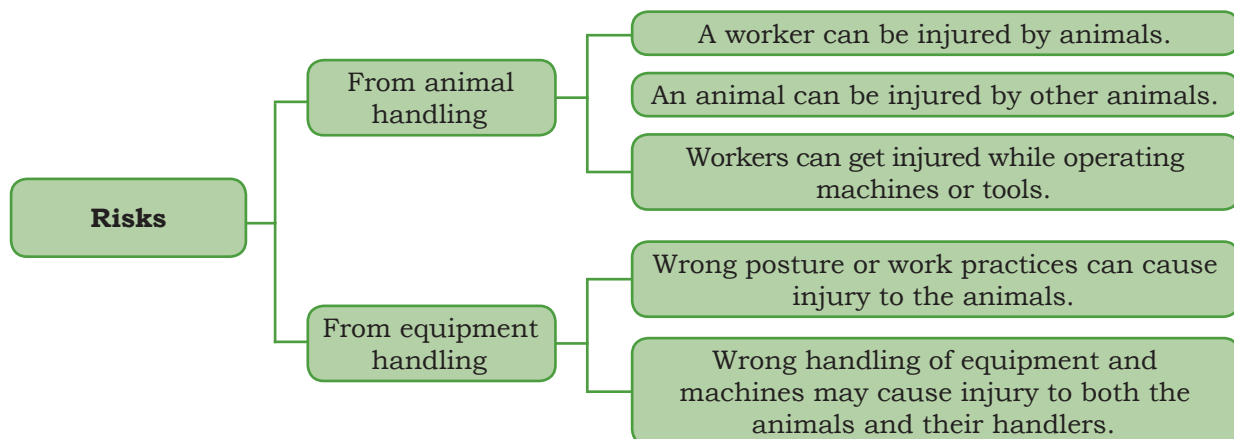


Fig. 4.2: Risks in a dairy farm



- Keep all equipment and tools at their designated places after use.
- Do not leave tools and equipment unattended in the farm.
- Reduce risk to bystanders while operating machines or tractors, and moving or handling the animals.
- One must communicate with the help of hand signals and signalling tools while working with noisy machines.
- Follow all government rules and environmental regulations at the workplace.
- Have clear work instructions and train the workers to reduce risks of accidents and hazards.
- Carry out mock drills to check the functioning of emergency equipment.
- Keep oneself updated on government regulations and schemes for efficient working and support.

Biosecurity

It refers to institutional and personal security measures to prevent the release of pathogens and infectious diseases in the environment. Hence, biosecurity involves actions to reduce chances of infectious diseases being carried to a dairy farm by people, animals, equipment or vehicles. It also includes adopting preventive measures to reduce chances of transmission of diseases when farmers, workers or animals exit the farm. Some of

the biosecurity measures that need to be adopted to check the spread of diseases and infections in animals are as follows.

Restricted access to farm

A livestock farm must be secured by fences or walls to check unauthorised entry of people or stray animals (Fig. 4.3).



Fig. 4.3: Signboard showing restricted entry to a farm



Provision of footbath

A footbath, containing disinfectants like phenol or lime powder, must be maintained at the entry and exit gates of the farm to prevent the spread of pathogens (Fig. 4.4).

Wear personal protective equipment

Animal workers and veterinarians must wear personal protective equipment, such as apron, gloves, mask, goggles and gumboots while handling the animals. Besides, they must wash their hands with water and an anti-bacterial soap and sanitise them frequently, especially, before and after coming in contact with the animals.



Fig. 4.4: Footbath at the entry of a farm

Cleaning and disinfecting the farm

One must follow these steps to clean and disinfect the farm premises.

- Remove used bedding and waste material from the farm (Fig. 4.5).
- Clean the animal shed floor and walls with detergent and water (Fig. 4.6).
- Spray disinfectants like phenol or bleaching powder on the floor and walls of the shed.
- Clean the equipment, feed tubs and buckets meant for animals with detergent and water.



Fig. 4.5: Farm workers cleaning a paddock



Fig. 4.6: A farm worker cleaning a shed with water

- In case of a disease outbreak, the farm must be fumigated with formalin and potassium permanganate crystals.
- Waste generated in the dairy farm, such as manure, feed, debris, etc., must be disposed of appropriately (buried or burnt).

Disposal of carcass

Death is normal in a dairy farm. Despite efforts to keep the animals healthy, some die on the farm due to diseases or accidents. A large number of animals may die because of natural disasters like flood, storm, extreme heat or cold and drought conditions. Deaths may also be attributed to chemical or toxic agents. Dead animals and other wastes (afterbirth or placenta) may pose a risk to biosecurity, and therefore, prove to be hazardous to the environment. Besides, they may even attract wild animals and stray dogs into the farm. Putrefaction of carcass results in gradual dissolution of tissues into gases, liquids and salts as a result of actions performed by bacteria and enzymes. The carcasses need to be disposed of appropriately and promptly so as to minimise soil and water contamination, checking the risk of outbreak and spread of diseases.

The various methods of carcass disposal are shown in Fig. 4.7. Among these, burial and open air burning are most commonly used for disposing carcasses.

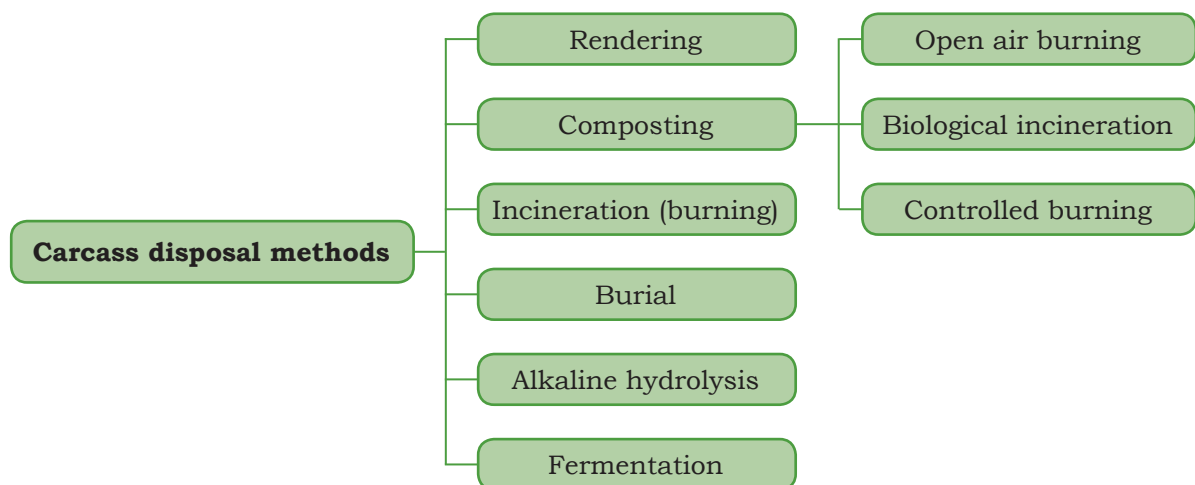


Fig. 4.7: Various carcass disposal methods



Burial

It means placing a carcass in a pit, i.e., below the ground surface and covering it completely with soil and lime. It is preferred as it is quicker, cheaper, hygienic and easy to execute. It is the most convenient method of disposing of a large number of carcasses. It is preferred when infectious agents are involved in the death of animals. A burial site or ground must be about 100 metre away from water sources like stream, pond or well. The carcass must be covered with at least two inches of top soil and lime after its placement in a pit.

Incineration (burning)

Incinerator is a machine fuelled by natural gas or electricity used for carcass disposal. There are three methods of incineration—open air burning, biological incineration and controlled burning. Open air burning is the most common method. It requires combustible material, such as timber and straw as fuel additives, to achieve the required temperature to completely incinerate the carcass. Smoke from such fires can be high in particulate matter and produce odour if the carcass has not burnt completely. Animal carcasses having high fat content like pigs are burnt much faster and require less fuel. The other two methods of carcass disposal are less common.

Composting

It refers to controlled decomposition of organic material. It is a process of aerobic microbiological decomposition conducted in open or closed systems. The process produces carbon dioxide, water vapour, heat and compost. 'Composting' is considered to be one of the most effective environment friendly methods of carcass disposal as the end product can be utilised as fertiliser.

Rendering

It is a heat-driven process, wherein, the carcass is exposed to a temperature of around 130 °C under pressure for killing pathogens. It is an environment friendly method of carcass disposal as it recycles animal protein from the carcass back into usable form as meat or bonemeal.



NOTES

Fermentation

This process is a closed system of anaerobic microbiological decomposition, which requires prior mechanical and thermal treatment. It produces biogas. This process does not inactivate pathogens but, typically, uses non-dried rendered product as input material.

Alkaline hydrolysis

Also called 'tissue digestion', alkaline hydrolysis is the latest technique for carcass disposal. The only by-product of the process are mineral constituents of the carcass's bones and teeth. The bone remnants can be collected and reused as calcium phosphate powder (sterile bonemeal). The process requires specialised equipment and works at 150 °C for three hours.

Practical Exercise

Activity

Demonstrate the cleaning and disinfection of a dairy farm.

Material required: cleaning appliances, disinfectants, notebook, and writing material

Procedure

- Visit a nearby dairy farm.
- Remove waste from the farm by using water and other cleaning material.
- Spray disinfectant, such as phenol or bleaching powder, on the floor and walls of the farm.
- Clean the equipment, feed tubs and buckets with detergent and water.
- Write down step-by-step procedure of cleaning the farm in your notebook and present it before the class.

Check Your Progress

A. Multiple Choice Questions

1. Bleaching powder is a _____.
(a) disinfectant
(b) antibiotic
(c) antiseptic
(d) detergent



2. What are the steps involved in cleaning and disinfection of a farm premises?
 - (a) Scrubbing and removal of waste
 - (b) Cleaning with detergent and water
 - (c) Spraying disinfectant
 - (d) All of the above
3. A carcass can be disposed by _____.
 - (a) burying
 - (b) burning
 - (c) incineration
 - (d) All of the above
4. What must be kept in mind while disposing of a carcass?
 - (a) Wear personal protective equipment
 - (b) Avoid direct contact with the animal's blood
 - (c) Avoid contact with the animal's parasites
 - (d) All of the above
5. Biosecurity means _____.
 - (a) security of the farm premises
 - (b) personal security
 - (c) preventing the release of pathogens in environment
 - (d) All of the above

B. Fill in the Blanks

1. _____ refers to institutional and personal security measures to prevent the release of pathogens and infectious diseases in the environment.
2. The burial ground must be about _____ metre away from a water source.
3. _____ is a machine fuelled by natural gas or electricity used for carcass disposal.
4. _____ is a closed system for mechanical and thermal treatment of carcass under pressure.
5. A carcass must be covered with a layer of lime and soil in _____ method of disposal.

C. Mark 'True' or 'False'

1. Incineration is a cheap method of carcass disposal.
2. A footbath must be maintained at the entry and exit gates of an animal shed to prevent the spread of pathogens.
3. An animal shed must have too many visitors.
4. A farm need not be made secured by fences and walls.
5. In case of a disease outbreak, a farm must be fumigated with formalin and crystals of potassium permanganate.



D. Match the Columns

- | A | B |
|----------------------------------|---------------------------|
| 1. Footbath | (a) Restricted access |
| 2. Personal Protective Equipment | (b) Phenol or slaked lime |
| 3. Farm waste | (c) Gloves |
| 4. Carcass | (d) Manure |
| 5. Biosecurity | (e) Burying |

E. Crossword

								¹ R	
			² A					E	
³ C		M		O		T	I	N	G
	⁴ B	U		I	A	L			
			O						
⁵ P	H		N	O	L				
								I	
								N	
								G	

Across

- Controlled decomposition of organic material.
- Placing a carcass below the ground surface and covering it completely with soil and lime.
- A disinfectant used in the footbath at the entry and exit gates of an animal shed to prevent the spread of pathogens.

Down

- It is a heat-driven process, wherein, the carcass is exposed to a temperature of around 130 °C.
- It kind of Personal Protective Equipment.

SESSION 2: FIRST AID FOR DAIRY ANIMALS

First aid is the immediate treatment given to animals and humans suffering from sudden illness or injury. In the dairy sector, first aid can be administered in case of emergencies that require immediate attention and action by an animal owner or animal health workers. It can be administered in case of infectious and non-infectious diseases, wounds, poisoning, electrocution and burns, etc. It aims to save an animal's life, minimise its pain, prevent its condition from getting worse and aiding to its recovery.



Fig. 4.8: A veterinarian checking a cow's temperature



Transmission of infectious diseases

Infectious diseases are transmitted from animal to animal or from animal to people by direct or indirect contact. Viruses, bacteria, parasites and fungi cause these diseases. There are five main routes of disease transmission (Fig. 4.9)

Routes of disease transmission

Aerosols

These refer to droplets sprayed by an infected animal while coughing and sneezing, which can spread infectious diseases in other animals and humans. Disease causing agents present in these aerosol droplets are passed from the infected animal to a susceptible healthy animal or humans.

Direct contact

In this case, a disease is transmitted from an infected animal or environment to susceptible animals through physical contact (Fig. 4.10). Infection causing organisms can enter the animals through open wounds, mucous membranes or skin, blood, saliva, nose-to-nose contact, rubbing or through bites of the infected animal. Diseases can also spread through venereal contact (from animal to animal through coitus) and also spread through in-utero route (from mother to offspring during gestation).



Fig. 4.10: Contact with infected animals can transmit diseases in both humans and animals.

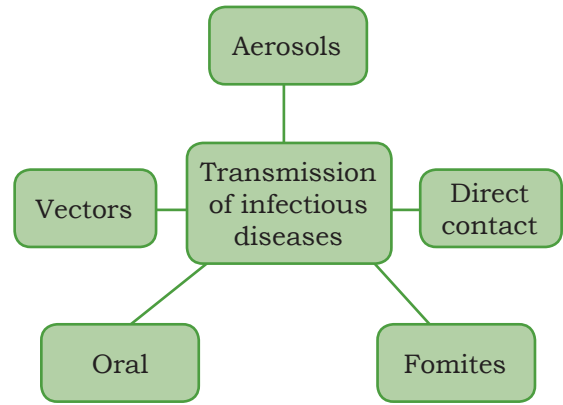


Fig. 4.9: Five routes of disease transmission



Fig. 4.11: Contaminated feed is a possible route of transmission of diseases.



Fig. 4.12: Contaminated water is a possible route of transmission of diseases.

Oral

Feed and water are sometimes contaminated with infection causing agents passed through saliva, nasal discharge, urine and faeces of the infected animal. Consumption of contaminated feed or water can transmit the disease to susceptible healthy animals (Fig. 4.11 and 4.12).

Fomites

Some infectious agents can live for a short span on inanimate objects like equipment, feed and water troughs, fencing, etc. When a healthy animal comes in contact with such objects, i.e, those having fomite presence, these infectious agents are transmitted to it. It is an indirect route of disease transmission.

Vectors

A vector acquires an infectious agent from a diseased animal and transmits it to healthy animals either by biting or sucking their blood. Flies, ticks, mosquitoes, etc., are common vectors.

Preventing transmission of diseases

Some of the practices followed for preventing the transmission of diseases from infected to healthy animals in a dairy farm are as follows.

Isolation of sick animals

All sick animals need to be isolated immediately to avoid direct contact with healthy animals.



Avoiding overcrowding of animals

The animals must be kept or tied at an optimal distance from each other so as to prevent direct contact and overcrowding, thereby, checking transmission of diseases.

Regular cleaning and disinfection of farm premises

Regular cleaning and disinfection of farm premises and fomites must be carried out to reduce incidents of transmission of infectious diseases.

Disinfection of farm equipment and vehicles

All farm equipment must be cleaned and disinfected to minimise chances of transmission of diseases through inanimate objects. Vehicles used for transporting animals can serve as a fomite ground, and hence, must be cleaned and disinfected on a regular basis.

Restricted entry to isolated sheds

Isolated sheds are areas, where sick animals are kept. These areas must have restricted entry in order to reduce chances of transmission of diseases to healthy animals and humans. The staff working in isolation sheds must take adequate precautions. They must wear personal protective equipment like full clothing, gloves, goggles, mask and gumboots.

Controlling transmission of diseases

Transmission of infectious diseases to other animals and humans can be controlled by maintaining hygiene in the shed and farm premises, and cleaning a diseased animal's body parts like muzzle, mouth, hooves, feet, etc., with an antiseptic solution. Cleaning and washing the body parts of the diseased animal with an antiseptic solution is important for treating infections, killing surface bacteria and checking the transmission of infection in other animals and humans.

Antiseptics

These are chemical agents that slow or stop the growth of microorganisms (germs) on the external surface of the diseased animal's body and mucous membranes, and hence, help prevent the spread of infections.





Fig. 4.13: Potassium permanganate is available in crystalline form.



Fig. 4.14: Potassium permanganate solution is the most commonly used antiseptic.

The skin and mucous membranes of the muzzle, mouth, nose, hooves and feet serve as a fertile ground for hosting microorganisms. When the skin or mucous membranes are damaged or breached, antiseptics are used to disinfect the area and reduce chances of infections.

Potassium permanganate solution

The most commonly used antiseptic is potassium permanganate solution (Fig. 4.14). Potassium permanganate is a chemical compound that is available in crystalline form (Fig. 4.13). Potassium permanganate at (0.01 gram) mixed with water (1 litre) is used externally on the skin. The solution must be prepared just before use. Apart from being used for washing a wound or any external injury on the skin, it is also used to rinse the muzzle and nose of the infected animal externally. The solution may be used several times a day.

How to prepare: Boil one litre of water and cool it to lukewarm level, say 40–45 °C. Mix 0.1 gram of potassium permanganate powder in this water and stir it till it dissolves. The solution, thus, prepared is light pink in colour.

Precautions while preparing the solution: While preparing the solution, do not allow potassium permanganate crystals to come in contact with the skin and eyes as they may cause irritation and damage to the affected area.

- The solution must be handled carefully as it may leave a stain on the skin, nails and clothes of the person handling it.
- Before using the solution, ensure that all crystals are dissolved in the water.

Cleaning and washing the muzzle

Muzzle is the protruding part of the animal's head, which includes nostrils, mouth and jaws. The muzzle of a healthy animal is always moist and free from discharge. On touching, it feels cool. On the contrary, if the animal is sick, its muzzle is dry and warm. If the muzzle is dry, it indicates that the animal is suffering



from a disease. If there is continuous watery or thick discharge from the animal's nostrils, it is ill. A sick animal's nasal discharge may carry infectious agents, which may contaminate the feed and water, thereby, transmitting infections to healthy animals. This is especially the case in farms as there is common feed and water for all animals. Therefore, to reduce the spread of diseases, the ailing animals are separated, and their muzzle is washed thoroughly with an antiseptic solution. The muzzle is cleaned twice or thrice a day to maintain animal hygiene.

Cleaning and washing the hooves and feet

Hooves and feet disinfection is another important step in controlling the transmission of diseases. Infection causing agents are present in the discharge and secretion of animals, which may contaminate the floor of the shed and even the grazing field. These infection causing agents may stick to the hooves of the animals and get carried to the farm. Therefore, for effective disinfection of the hooves, a footbath is constructed at the entry gate of the farm. The footbath is a especially designed area about 9–15 feet in length, 3 feet wide and 6 inches deep. It is filled with a disinfectant solution. The animals have to pass through it everytime while entering or exiting the farm, which implies that they disinfect their hooves several times a day. Therefore, the location of the footbath must be such that the animals have to pass through it several times a day. A common solution used in the footbath is 5 per cent copper sulphate. As per a general rule, the footbath solution must be changed after the passage of 150–300 animals.

Non-infectious conditions and first aid

Some of the non-infectious conditions observed in dairy animals are indigestion and anorexia, constipation, tympany, impaction and diarrhoea. Early detection of these conditions may help carry out preliminary treatment easily. However, if there is no relief within few hours after giving preliminary treatment to a sick animal, then such conditions could be life threatening.



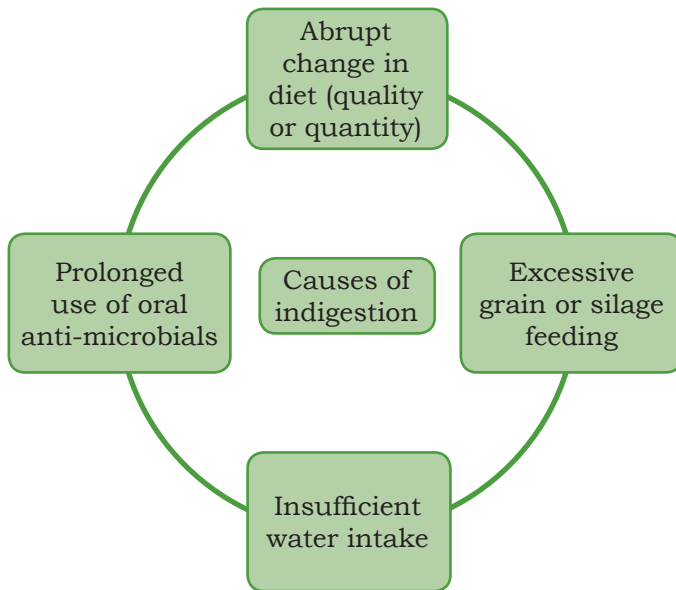


Fig. 4.15: Primary causes of indigestion in dairy animals

Indigestion and anorexia

Simple indigestion and anorexia are minor disturbances in the digestive function of farm animals. These are common in ruminants like goats and sheep. Simple indigestion is the failure of normal rumen movement, which means rumen mobility slows down but does not stop. Ruminants are animals with a four-compartment stomach, including the rumen (largest compartment), reticulum (honeycomb lining), omasum (many plies) and abomasum (gastric compartment). Microorganisms living in the rumen digest and utilise fibrous content present in the feed that they eat. The

rumen functions in coordination with the reticulum to support contractions of the muscle that create functions of rumination (cud chewing and rumen contractions) and eructation (gas release). Simple indigestion in dairy animals occurs due to various reasons. The primary causes are depicted in Fig. 4.15. The most common sign of indigestion and anorexia is that the animal is off feed either partially or completely. The ruminal content becomes firm, so there may be mild bloating or swelling on the left flank.

Treatment

The treatment is aimed at correcting the suspected contaminated diet. Spontaneous recovery occurs when the animals are fed typical roughage. Making an adult animal drink about 20 litre of lukewarm water or administering saline orally may help restore normal rumen function.

Constipation

This is characterised when the animal cannot defecate or passes hard droppings with difficulty. Constipation is regarded as a sign of other diseases apart from being a disease itself.



Treatment

Constipation can be treated by giving enema to the affected animal. Enema is the administration of warm soapy water into the animal's rectum through anus. The animal must be given plenty of drinking water.

Tympany

This is characterised by abnormal distension of the rumen and reticulum caused by accumulation of gases in the rumen. The most common signs include distended left abdomen or dorsal abdomen left to the midline, pain and discomfort, animal refusing to graze, strain while urinating and defecating, and rapid or difficult breathing. The animal's mouth may be open with the tongue protruding out, and eventually, it may die, if tympany is not relieved.

Treatment

For the treatment of early or mild cases, an anti-bloat preparation available in market can be administered to the ailing animal orally. In moderately affected animals, a stomach tube can be inserted to release the rumen gas. In severe cases, a trocar and cannula are inserted into the rumen high on the left flank (where swelling is the maximum) to release the rumen gas. The insertion of a stomach tube or trocar and cannula requires special veterinary training. Vegetable oil (250–500 ml) or paraffin oil (100–200 ml) is traditionally used to relieve the animals.

Impaction

Rumen impaction is a condition characterised by dense packing of rumen with indigestible roughage. It is caused due to ingestion of a large amount of highly fermentable carbohydrate rich food or leftover or waste eatables of parties. The common signs start appearing within 6–12 hours of ingestion, and include restlessness, kicking in the belly, frequent lying down and getting up, and enlargement of the left side of the dorsal abdominal region. The affected animal is completely off feed and may eventually die.

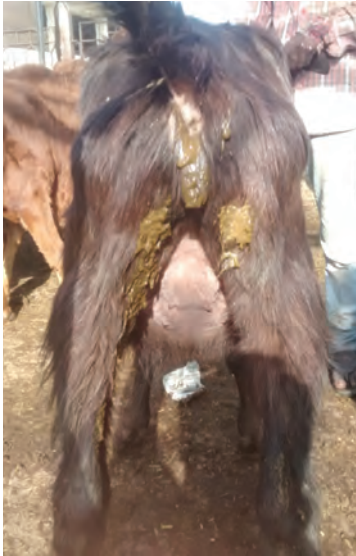


Fig. 4.16: Diarrhoea in a buffalo calf

Treatment

To treat impaction, the affected animal must have restricted access to grains. The animal must be made to exercise vigorously for half-an-hour thrice a day. About 200–400g of Sodium bicarbonate can be given orally with water to adult cows and buffaloes.

Diarrhoea

It is characterised by frequent passage of loose and watery faeces. The faeces may vary in consistency from animal to animal from being soft to liquid. In diarrhoea, excessive water is lost with faeces, causing dehydration in the affected animal (Fig. 4.16). The animal shows signs of dullness, depression, lethargy, weakness and sunken eyes. Diarrhoea can be caused due to infection or dietary reasons.

Treatment

In case of diarrhoea, the animal's diet must be corrected. If it is due to some infection, the animal must be given an appropriate medicine. The animal's digestive system must be given rest by withholding the feed partially or offering light and easily digestible feed to it for the first 24 hours. In case of dehydration, the animal must be made to drink plenty of water. To correct electrolyte loss due to diarrhoea, the animal can be given glucose along with electrolyte solution orally.

First aid for other diseases and conditions

Poisoning

It occurs when an animal consumes a toxic substance or venom of other animal. Poisoning causes deleterious effect on the animal and can even be life-threatening. Animals may swallow, inhale or absorb poison or toxic substances through the skin. Sometimes, it may even be injected into the animal. Medicine overdose can also be poisonous, and hence, dangerous. Usually, farm animals can get poisoned by eating plants that contain poisonous substances or accidentally ingesting urea, rodenticides, pesticides, etc.

Poisoning can cause minor irritation, mild abdominal pain, dullness, depression and refusal of feed. In severe



cases, the affected animal may suffer from sudden muscular trembling, convulsions, excessive frothing from the mouth and even death.

Different animals are allergic to different plants. The age of the animal is also important. Young animals are, generally, more susceptible to diseases and infections than older ones.

Treatment

In case poisoning, pay immediate attention to the affected animal. If the route of poisoning is through ingestion, then purgatives may be given to the animal. Under field conditions, the animal may be fed with 'crushed coal' as it is a universal antidote for poisoning. If the animal is suspected to be poisoned through the skin, it must be thoroughly washed with soap and water. Besides, veterinary advice is necessary.

Sunstroke

Also known as 'heatstroke', it is an emergency condition that occurs due to muscular exertion of the animal in high environmental temperatures and humidity. Sunstroke causes hyperthermia in the animal. 'Hyperthermia' is the elevation of body temperature above 104 °F. Sunstroke causes increased heart and respiration rate, restlessness, difficulty in breathing, and sometimes, even convulsions, eventually followed by the animal's death.

Treatment

In case of heatstroke, one must first aim at reducing the animal's body temperature. The animal must be immediately moved to a cool and ventilated area. Cold water must be poured on its body. Besides, adequate glucose and cold water must be given to the animal orally. Cold water enema may also be administered. Veterinary help is required for complete recovery of the animal.

Electrocution

It refers to accidental injury or death caused by electric shock or current passing through the animal's body. It is caused by lightning, high voltage electric current

from fallen transmission wires, accidental chewing of live electric cords, etc. The animal may come in contact with such wires near ponds and other areas.

The most common clinical sign of electrocution is varying degrees of electric shock. The sign depends on the voltage to which the animal is exposed to. In most cases of electrocution by lightning, the animal collapses and dies on the spot. In some instances, the animal may become unconscious but recover in few minutes to several hours. Other signs may include depression, blindness, etc., which may persist for few days or weeks.

Electrocution due to lightning can be detected on the basis of the history of lightning, injury mark on the carcass, damage to the surrounding environment like burning of an adjoining field or area.

Treatment

Treatment is, generally, carried out in animals, who are mildly affected, and on the basis of the clinical signs they show. The affected animal must be kept in an area with minimum disturbance. It must be made to drink plenty of water. Antibiotic cream or solution must be applied on the wound.

Burns

Burns or burn injury refers to a type of thermal injury caused by fire or a hot solid object. Injury caused by hot fluids or steam is called ‘scalding’. The extent of a burn injury depends on the temperature of the hot object and duration for which the animal came in contact with it. Depending on the involvement of skin tissues, burns may be classified into three degrees — first, second and third.

Table 4.1: Classification of burn injuries

First degree	Second degree	Third degree
<ul style="list-style-type: none"> • Only superficial and outer layer of the skin is affected. • It is a mild injury and the animal recovers in few days. 	<ul style="list-style-type: none"> • There is partial thickness of the skin. • Vesicles are formed. Care must be taken for speedy recovery of the animal and prevention of secondary infection. 	<ul style="list-style-type: none"> • There full thickness of the skin. Underlying organs may also get affected. • It is the most severe form of burn injury. Extra care and attention is required to cure the affected animal.



The common clinical signs of burns include pain, thirst, anaemia and loss of necessary salts from the body. There is swelling, redness and blisters on the affected area. The recovery and survival of the animal depends on the body area affected rather than the degree of the burn.

Treatment

Dressing the burn with an antiseptic solution or cream must be done immediately after consulting the veterinarian. Efforts must be made to prevent the wound from getting contaminated. The affected area must be covered with a clean and sterile cloth. Sufficient drinking water and glucose solution must be given to the animal.

Wounds

A wound may be defined as an injury on the skin or other body tissue caused due to a cut, blow or other reasons. In farm animals, wounds often go unnoticed and are allowed to heal on their own without any dedicated care or treatment. Accurate and timely treatment of wounds decrease the blood flow. The method of treatment varies for different kinds of wound. Wounds may be of different types (Table 4.2).

Table 4.2: Types of wound and their characteristics

Wounds	Characteristics
Incised wound	If the tissues are severed by a sharp object and the edges of the wound are smooth, it is called 'incised' or 'clean-cut' wound. It is common in case of operative wounds.
Lacerated wound	When tissues get torn unevenly, such a wound is known as 'lacerated' wound, for example wound due to wire cut.
Contused wound	Such a wound is an injury caused by a blunt object. Such an injury may be superficial or deep. Superficial contused wounds may be an abrasion on to the skin or mucous surface. Deep contused wounds may be followed by loss of tissue or sloughing and are, generally, irregular with swollen margins. Such injuries are commonly caused by kicks.
Punctured wound	Such a wound is deeper than the width of the break in the skin or mucous membrane. It is caused by sharp objects, such as nails, splinters of wood, etc.



Fig. 4.17: Wound on the horn of a buffalo

How to control bleeding wound?

'Bleeding' or 'haemorrhage' is the most common symptom in haemorrhagic wounds. The degree of haemorrhage depends on the kind, number and size of the blood vessels severed. An animal with a bleeding wound is shown in Fig. 4.17. Death may also occur in case of severe bleeding.

Heat, ligation, pressure and torsion are some of the ways to treat a bleeding wound. Applying chilled water is effective in controlling bleeding from small blood vessels. Ligation and torsion of the cut end of large blood vessels must be practised. Applying hand pressure over the surface of the wound is the most convenient method of controlling bleeding in most cases. Whenever possible, the area must be bandaged with a clean cloth or bandage. Before putting on the bandage, the wound must be covered with a piece of sterile absorbent cotton that is dusted with boric acid. Bleeding from a wound that cannot be stopped by bandaging may temporarily be stopped by applying hand pressure or stuffing, padding it with absorbent cotton and holding it in place with sutures. The bandage must be left in place for 12–36 hours, depending on the extent of bleeding and type of the wound.

Management of wounds

The wounded area must be carefully examined for foreign objects or particles like hair, dirt, gravel, wood or glass pieces, nails, etc. Hair and torn tissues along the margins of a wound, which can interfere with the healing process, must be trimmed. Drainage must be provided for the secretion of pus. Suturing of the wound depends on its type and location. A wound must not be closed with sutures unless it is clean and shows no signs of sloughing. A severely infected wound must be left open unless a satisfactory drainage for pus and secretions is made. Wounds in muscles near movable joints must also not be sutured.

After treatment, the animal must be kept in a clean place. It must be stopped from biting, licking or nibbling



the wound. Dirt and rubbing against weeds and grass can irritate wounds in the foot region. So, the animal must be kept in a clean shed until the wound heals. Local treatment consists of keeping the wound clean by washing it daily and applying an antiseptic ointment, lotion or powder.

Prolapse of the uterus

It is a condition, wherein, the uterus comes out of the animal's vagina. It, normally, occurs immediately after calving or few hours after calving, or in some cases, the last stage of pregnancy. It is, usually, observed in old and malnourished animals. Animals with calcium deficiency are susceptible to prolapse of the uterus. Some breeds of cattle are, particularly, susceptible to uterine prolapse, in which mass uterus is found hanging through the vulva. In delayed cases, the mass may get ruptured or lacerated as the animal rubs it against the ground or walls of the shed.

Treatment

The dairy farmer or animal health worker must immediately wash the prolapsed mass of uterus with mild antiseptic solution. If there is swelling of the mass, it can be reduced by rubbing ice. Alternatively, saturated sugar solution may also be applied to reduce swelling of the mass. The animal health worker or dairy farmer must immediately wrap the prolapsed mass with a wet towel and try to keep it raised up to the level of the vulva. The prolapsed mass must not be allowed to dry. Injury to the prolapsed mass must be avoided and a veterinarian must be immediately called to treat the animal.

First aid kit for dairy animals

The first aid kit must be kept at an accessible place, which must be clean, cool and dry. Besides, it must be easy to carry. It is advisable to stick contact details of important persons like farm owner, veterinarian, etc., on the side of the kit, which can be accessible to others in case the animal caretaker is absent. Some of the items the first aid kit must contain are as follows.



NOTES

- Scissors
- Flashlight
- Halter and rope
- Needle-nosed pliers
- Wire cutters
- Disposable gloves
- 4×4" gauze sponges
- Skin cleansers
- Small bottles of sterile saline
- Water soluble ointment
- Anti-bloat medicine
- Trocar and cannula
- Rolls of medical tape
- Fly repellent
- Large syringes (10–50 ml)
- Cotton
- Antibiotic ointment for eyes
- Thermometer
- Antiseptic solution

Maintaining the first aid kit

- The first aid kit and the items present in it must be labeled neatly.
- It must be placed at an accessible place.
- The items in the kit must be checked from time-to-time for replenishment and replacement in case of expiry.
- Clean the first aid equipment after every use.

Measures to be taken during first aid treatment

- Try to learn about the history of a case to rule out possible causes.
- Ensure adequate ventilation and fresh air in the treatment area.
- Check for bleeding immediately as severe blood loss can even cause the death of an animal.
- Provide enough warmth to the animal to prevent fluctuations in body temperature.
- Ensure that the animal's posture is comfortable.
- All open wounds must be dressed in order to prevent the spread of infection(s).



Practical Exercise

Activity

Demonstrate the steps to control transmission of infectious diseases in animals.

Material required: antiseptic solution, personal protective equipment, first aid kit and writing material

Procedure

- Visit a nearby farm.
- Maintain a hygienic environment in the farm.
- Isolate the infected animal.
- Clean the animal's body parts like muzzle, hooves, feet, etc., with an antiseptic solution.

Check Your Progress

A. Multiple Choice Questions

1. The main routes of disease transmission are _____.
(a) aerosol (b) direct contact
(c) oral (d) All of the above
2. Disease transmission can be prevented by _____.
(a) avoiding overcrowding of animals
(b) isolating all sick animals
(c) cleaning and disinfection of the farm premises
(d) All of the above
3. The passage of loose and watery faeces in increased frequency is known as _____.
(a) diarrhoea (b) impaction
(c) anorexia (d) injury
4. Abnormal distension of the rumen caused by accumulation of gases is known as _____.
(a) tympany (b) impaction
(c) indigestion (d) None of the above
5. The items for a livestock first aid kit include _____.
(a) scissors (b) halter and rope
(c) flashlight (d) All of the above

B. Fill in the Blanks

1. For disease control, isolation of _____ animals is required.
2. _____ is a condition, in which animals come in consume toxic substances.
3. Uterine prolapse is protrusion of the uterus through the _____.
4. A general rule is to change the footbath solution is after the passage of every _____ animals.
5. The most commonly used antiseptic is _____ solution.

NOTES



NOTES

C. Mark 'True' or 'False'

- Flies, ticks and mosquitoes are common vectors.
- The muzzle of a healthy animal is moist and cool.
- Constipation occurs when an animal can easily defecate.
- Enema is the administration of a medicine or warm soapy water through the anus.
- Simple indigestion is a minor disturbance in the digestive function.

D. Match the Columns

- | A | B |
|--------------------|--|
| 1. Rumen | (a) Toxic substance |
| 2. Constipation | (b) Heatstroke |
| 3. Poisoning | (c) Largest compartment of the stomach |
| 4. Sunstroke | (d) Electric shock |
| 5. Electrocutation | (e) Animal cannot defecate |

E. Crossword

	¹ P	R		L		² P		E
						O		
						I		
			³ B	U		N		
⁴ T		M	P		N			
			⁵ W	O		N		
						G		

Across

- A condition in which the uterus comes out of the vagina.
- It is a type of thermal injury caused by fire flames and hot solids.
- It is an abnormal distension of the rumen and reticulum caused by accumulation of gases in the rumen.
- An injury to the skin or other body tissue(s) caused due to a cut, blow or other impact.

Down

- It is a condition in which animals are poisoned by toxic substances.



Unit

5



Entrepreneurship

INTRODUCTION

Entrepreneurs are self-employed people and create job opportunities for others. They perceive an idea, and organise production or services by mobilising resources. They, then, market products and services in order to earn profits. Their work may involve initial risks but promising rewards.

Dairy farming is one of the important activities carried out by people in rural areas of our country. The importance of dairy farming is only next to agriculture. It not only provides continuous income to a dairy farmer and improves the dietary standards of the person's family but also reduces unemployment to a large extent. This Unit focuses on how to develop entrepreneurship skills in dairy farming.



171209CH05

SESSION 1: FUNDAMENTALS OF ENTREPRENEURSHIP IN DAIRY BUSINESS

Agri Business Incubation

The Government of India launched the Agri Business Incubation (ABI) scheme in 2003. The scheme aims to create an ecosystem for startups in the dairy sector so as to facilitate entrepreneurship

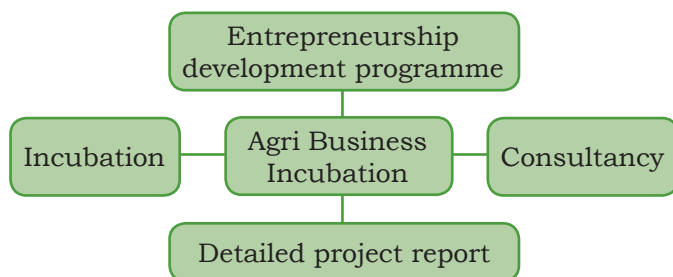


Fig. 5.1: Components of Agri Business Incubation

development in its various areas. Entrepreneurship development programmes play a vital role in ensuring an inclusive and sustainable agricultural system, as well as, livestock farming. The different components of ABI are shown in Fig. 5.1.

Entrepreneurs and their characteristics

Dairy entrepreneurs are people who seek self-employment opportunities by setting up a dairy farm, organising production of milk by mobilising resources, and finally, marketing milk and other dairy products to earn profits. The important characteristics of an entrepreneur are as follows.

- Confident
- Takes initiative
- Innovative
- Updated
- Persistent
- Systematic planner
- Goal setter
- Risk taking attitude
- Tries to cash in on opportunities
- Persuasive skills
- Problem solving attitude
- Efficient worker
- Committed to work as per contract rules

Entrepreneurship opportunities in the dairy sector

At present, the Government of India's policy is to encourage self-employment rather than creating salaried jobs. There are self-employment opportunities in almost all fields. Self-employment opportunities reduce unrest among the young population. For rural people, self-employment in the dairy sector is most suitable. The various self-employment opportunities in dairying are shown in Fig. 5.2.





Fig. 5.2: Self-employment opportunities in the dairy sector

Categories of dairy entrepreneurs

Dairy entrepreneurs may be categorised into three types based on the type of risk they are willing to take. The risk taking attitude is not an inborn trait but is built gradually. Different people have different risk taking orientation by virtue of their background, personality, socialisation skills and experiences. Risk is a situation, involving exposure to any kind of danger and the consequent losses.

Table 5.1: Categories of dairy entrepreneur

High risk entrepreneurs	Moderate risk entrepreneurs	Low risk entrepreneurs
<ul style="list-style-type: none"> When complete and necessary information about various aspects of dairy farming is not obtained and the venture is started, it is a situation of high risk. Such entrepreneurs do not consider the resources available or reflect on their experiences, and hence, tend to make arbitrary decisions. 	<ul style="list-style-type: none"> They do a lot of calculation about their strengths and weaknesses, capabilities and resources in the dairy business before taking a decision. They are clear about their goal. They assess various alternatives to reach their goal. Their target is to achieve at least 40–60 per cent profit so as achieve the desired outcome. 	<ul style="list-style-type: none"> Such people undertake a certain activity, wherein, they want 100 per cent success. They do not like to face a situation, where there is even 1 per cent chance of failure. Such entrepreneurs tend to achieve the goal within the limited resources. They like to shoulder responsibilities for the performance of the business. But on failure, they own the responsibility and try to understand the reason behind it. They want to rectify it in the next attempt.

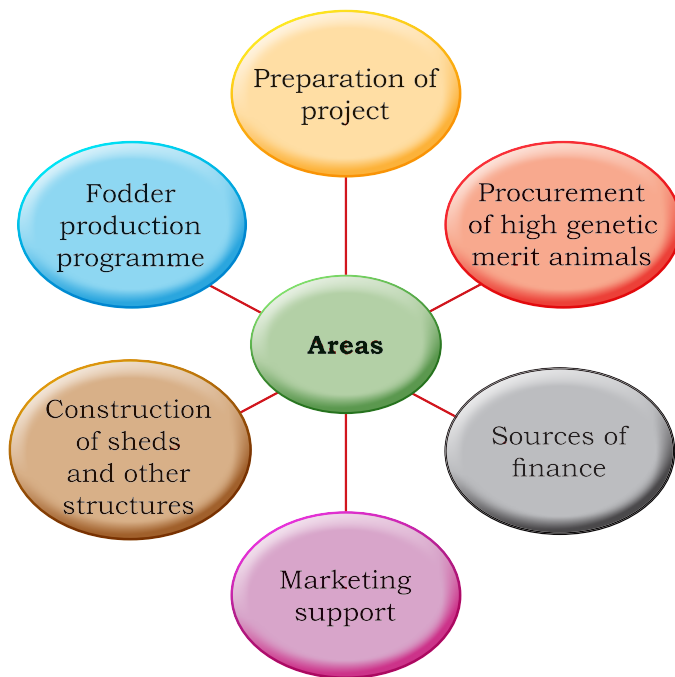


Fig. 5.3: Areas where a dairy entrepreneur needs help after training

Steps for becoming a dairy entrepreneur

After deciding to become a dairy entrepreneur, the person needs to gather information on how to procure the necessary infrastructure and resources, check on the availability of animals to set up a dairy farm, potentiality and feasibility of fodder production, etc.

After collecting the initial information, the entrepreneur needs to undergo training in various aspects of dairy farming like setting up a feed manufacturing unit, managing different categories of dairy animals like calves, heifers, lactating, dry and pregnant cows and buffaloes, marketing of the produce like milk and milk products, etc. During the training programme, the



entrepreneur must understand the pros and cons of the various aspects of production. After completing the training, the person is ready for the implementation stage. As the entrepreneur is new, support needs to be provided in areas as shown in Fig. 5.3.

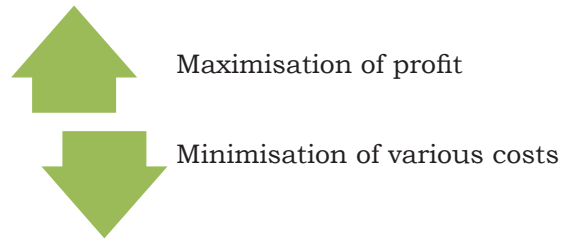


Fig. 5.4: Law of dairy economics

Fundamentals of dairy economics and finance

The fundamentals of economics and finance are no different in dairying as compared to other sectors. Economics deals with the optimum utilisation of resources. The basic questions in finance, such as return on capital, are as much applicable in the field of dairying as in any other sector like crop production, transport, housing, etc. Dairy production economics is concerned with the choice of production pattern and resources used to maximise the objectives of the dairy farmer. The law of dairy economics (Fig. 5.4) explains the conditions under which dairy production (profit and output) and various costs can be maximised and minimised, respectively.

Economic aspects in dairy farming

Diversified farming

Dairy animals fit well in diversified farming programmes. These animals can be clubbed with agriculture, fishery, horticulture, etc., thereby, helping the farmer earn extra income.

Utilisation of agricultural by-products

In agriculture, major by-products like straws are bulky in volume and the farmer is compelled to sell them at throwaway prices. It is also not economical to transport them to far-off places for selling. Dairy animals consume such by-products and convert roughage into milk.

Price fluctuations

Unlike agricultural produce like grain, pulses, etc., price fluctuations in milk and milk products is comparatively less, though it depends on the demand and supply chain.



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Seasonality of income

Agricultural income is seasonal in nature as farmers receive income only on the harvest of crops. On the other hand, dairy enterprise provides income on a daily basis throughout the year.

Maintaining soil health

Fodder is grown on farms to provide feed to the animals. These are soil conserving and soil building crops. The manure produced may be utilised as natural fertilisers for growing agricultural crops economically.

Draft power

Male animals are utilised for draft purposes. In India, most small farmers still use bullock power. The size of land holdings is small and they are becoming even smaller. These farmers cannot afford mechanical farm operations. Therefore, utilising draft power is the best option available before them.

Factors influencing dairy economics

Economics of feed and fodder

The main objective of dairy economics is to reduce the feed cost as it roughly accounts for 60–70 per cent of the total production cost. Economic feeding practices are important as they can alone decrease the cost of milk production. Feeding *ad libitum* green forage will decrease the feed cost, thereby, reducing the milk production cost. Feeding leguminous fodder improves milk production. The use of unconventional feed like brewer's waste, pea pods, etc., that are available at low prices may also be used to reduce the feed cost, resulting in lower cost of milk production. Fodder availability remains excess during the rainy season. Excess green fodder with desired nutritive value can be preserved in the form of silage or hay and used during the lean period. This will also help reduce the cost of milk production.



High yielding animals

Selecting high yielding animals is important for dairy farming. Unless the animals have a high yielding capacity, even quality feeding or increasing feed quantity cannot improve milk production.

Replacement of uneconomical animals

Dairy animals can economically produce milk only up to five to six lactations. In subsequent lactations, milk production drops significantly. Therefore, the animals must be culled (removal of unproductive animals from a farm) and replaced with heifers reared at the farm itself or animals of high genetic merit. Replacement of unproductive animals by farm grown heifers is comparatively more economical. Moreover, the entrepreneur must also have information about the ancestry of the animal.

Management aspects

These are the key in maintaining the optimum production level and keeping the animals healthy. Poor health of animals reduces milk production drastically. It takes a lot of time to make the animals healthy enough so as to reach their original level of milk production, thereby, incurring huge economic losses to a farmer.

Efficient use of labour

The labourers need to work efficiently to ensure that the farm to generates maximum profit. This further improves the economics of milk production.

Efficient marketing of milk

It plays a major role in the dairy business. Even a small increase in the sale price of milk will have a major impact on the economics of dairy farming.

Sound business practices

Business practices, appropriate to dairy farming, are important at all levels, such as purchase of inputs, disposal of products and by-products, etc. The optimum use of land and manure to produce fodder crops with less investment affects the economics of milk production in a dairy farm.



Lactation period is the time from calving until the cow or buffalo dries off, i.e., the time during which the animal is producing milk.

Dry period is the time from the end of lactation till the animal gives birth.

Starting a dairy business

A person must have experience in handling dairy animals before venturing into dairy business. For those entrepreneurs, who do not have first-hand experience in the sector, it is essential that they themselves work in a dairy farm first before starting a dairy business. They must begin with few dairy animals, and gradually, increase the herd size as their experience and confidence grows. As a beginner, the entrepreneur must strive to keep costs to the minimum. For example, the person can hire few local people as labourers as it is easier to cut down labour costs in the beginning. The entrepreneur must interact with other dairy farmers in the area for advice and suggestions, and share ideas and equipment. The entrepreneur must be open to new ideas being introduced in the sector to improve one's business efficiency. Dairying is a challenging business for the following reasons.

- It is a capital, labour and management intensive business, prone to outbreak of diseases.
- It is difficult to set up a dairy business in an urban area due to high cost of land and labourers, even though a majority of the consumers live in urban areas.
- The waiting period for returns is long in milk production business. The maturity period for cows and buffaloes to start producing milk takes time, thus, leading to tight profit margin.
- Maintaining constant milk quality and production is a challenging task.
- Marketing of milk and milk products is challenging.
- It is difficult to increase the scale of operation.

Preparing a dairy business plan

The plan for starting a dairy business must include the following information on technical, financial and managerial aspects, based on the type of unit to be set up and its capacity.



Technical aspects

- Land and land development (location, area, proximity to connecting and main roads, site map, etc.)
- Proposed number of milch animals
- Civil structures (different type of sheds to house adult animals, heifers, calves and bulls, storeroom, milking parlour, etc.)
- Equipment and machinery (chaff cutter, milking machine, feed grinder and mixer, milking pails and cans, biogas plant, bulk coolers, etc.)
- Maintenance of records (breeding record, source of purchase of feed and medicines, place of purchase, final cost of the animals)
- Production parameters (milk yield per day, lactation, dry period, parity)
- Breeding facilities (availability of semen and expenditure per animal)
- Expenditure on veterinary help, labourers and other staff required in the farm
- Expenditure on electricity and drinking water, including expense on creating structures for these facilities
- Marketing of milk and considerations for place of marketing, distance of market from the farm, selling price of milk, periodicity of payment to be received
- Miscellaneous aspects, such as selling of culled animals, manure, empty gunny bags, etc.

Financial aspects

- Financial viability (internal rate of return, benefit cost ratio, net present worth)
- Financial position of borrowers, such as profitability ratios
- Lending terms (rate of interest, grace period for loan, repayment period, nature of security)



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Managerial aspects

An entrepreneur's profile must be assessed on the following points.

- Individual, partnership, cooperative society or others
- Capability in managing a dairy farm
- Previous experience in dairy farming
- Financial soundness
- Technical and other relevant qualification
- Adequate number of technical and managerial staff

Other aspects

- Name of the financial institution
- Training facilities
- Assistance available from State or Central government
- Regulatory clearances, if any, etc.

Common lending terms of financial institutions

After ensuring technical feasibility and economic viability, a scheme is sanctioned by a bank. The loan is disbursed in two to three stages against the creation of specific assets, such as construction of sheds, purchase of equipment and machinery, purchase of animals and recurring cost on the purchase of feed or fodder for the initial period of one to two months. The end use of the funds is verified and constant follow-up is done by the bank. Commonly practised lending terms of most banks and other financial institutions are as follows.

Net Present Value (NPV)

The NPV of a project is the potential change in an entrepreneur's wealth caused by the dairy project, while the time value of money is being accounted for.

Internal Rate of Return (IRR)

It is used to evaluate the attractiveness of a project or investment. If the IRR of a new dairy project exceeds the bank's required rate of return, then that project is desirable. If the IRR falls below the required rate of return, the project must be rejected.



Benefit Cost Ratio (BCR)

It is an indicator used in cost-benefit analysis and attempts to summarise the overall value for money of a project or proposal.

Profitability ratios

Such ratios in dairy business are used to assess the farm's ability to generate earnings compared to its expenses and other relevant costs incurred during a specific time period.

Table 5.2: Project details of a business plan for 10 crossbred cows

S. No.	Basic assumptions	Units
1.	No. of crossbred cows	10
2.	No. of animals per batch	5
3.	Cost of animal (₹/animal)	40,000
4.	Selling price of culled animal (₹/animal)	5,000
5.	Transportation cost (₹/animal)	2,000
6.	Average milk yield per cow (litre/day)	10
7.	Floor space per adult animal (sq ft)	120
8.	Cost of construction per sq ft (₹)	600
9.	Cost of chaff cutter (power operated in ₹)	60,000
10.	Cost of equipment per animal (₹)	1,000
11.	Insurance premium (per annum)	4%
12.	Veterinary aid/animal/ year (₹)	2,000
13.	Feed requirement	
	• Concentrate for maintenance (kg/animal/day)	1.5
	• Concentrate for milk production (kg/kg milk yield)	0.4
	• Green fodder (kg/animal/day)	20
	• Dry fodder or wheat straw (kg/animal/day)	4
14.	Cost of concentrate feed (₹/kg)	22
15.	Cost of dry fodder (₹/kg)	5
16.	Cost of green fodder (₹/kg)	2
17.	Quantity of concentrate feed in one bag (kg)	50
18.	No. of labourers*	1
19.	Salary of each labourer per month (₹)	7,000

*One person can manage 10 lactating animals



20.	Cost of electricity and water/animal/year (₹)	300
21.	Selling price of milk (₹/litre)	42
22.	Sale price per gunny bags (₹)	15
23.	Income from manure (per animal/year in ₹)	1000
24.	Lactation days	305
25.	Dry days	90

Table 5.3: Cows purchased

Total number of animals	10
Batch 1: animals purchased at the initiation of the project	5
Batch 2: animals purchased after six months of project initiation	5

Table 5.4: Calculation of lactation and dry days

Particulars	Days	Year				
		1	2	3	4	5
Batch 1	Dry days			20	45	70
	Lactation days	270	295	300	300	295
	Dry days	90	70	45	20	
	Lactation days	5	—	—	—	—
Batch 2	Dry days	—	—	—	—	—
	Lactation days	180	90	115	195	220
	days		90	90	90	90
	Lactation days		185	105	80	75
Total for a pair of animals	Lactation days	455	570	520	575	590
	Dry days	90	160	155	155	160
Yield of two animals		4550	5700	5200	5750	5900

Table 5.5: Year-wise feed requirement (kg) for different categories of animals

Feed	Animal	Year				
		1	2	3	4	5
Concentrate (kg)	Milch	12512.5	15675	14300	15812.5	16225
	Dry	675	1200	1162.5	1162.5	1200
Green fodder (kg)	Milch	45500	57000	52000	57500	59000
	Dry	9000	16000	15500	15500	16000
Straw (kg)	Milch	9100	11400	10400	11500	11800
	Dry	1800	3200	3100	3100	3200



Table 5.6: Year-wise milk production (kg), and availability of gunny bags

Item	1	2	3	4	5
Milk	22750	28500	26000	28750	29500
Gunny bags	176	225	206	226	232

Table 5.7: Economics of dairy project for a unit of 10 cows for five years

Capital expenditure	Rate (₹)	Units	Total (₹)
Land		Available with the entrepreneur	
Cost of construction of sheds	600	1200	7,20,000
Cost of cows	40,000	10	4,00,000
Transportation cost of cows	2,000	10	20,000
Cost of equipment	—	—	—
Farm implements (bucket, rope, etc.)	1,000	10	10,000
Cost of chaff cutter (power operated)	—	—	60,000
Total capital expenditure	—	—	12,10,000

Total project cost is ₹12.1 lakh

Table 5.8(a): Year-wise recurring expenditure (₹)

Items	Year				
	1	2	3	4	5
Feed					
• Cost of concentrate	2,90,125	3,71,250	3,40,175	3,73,450	3,83,350
• Cost of green fodder	1,09,000	1,46,000	1,35,000	1,46,000	1,50,000
• Cost of straw	54,500	73,000	67,500	73,000	75,000
Cost of health coverage for cows	15,000	20,000	20,000	20,000	20,000
Labour charge	84,000	84,000	84,000	84,000	84,000
Electricity and other charges	3,000	3,000	3,000	3,000	3,000
Cost of insurance premium of cows	16,000	16,000	16,000	16,000	16,000
Total recurring expenditure	5,71,625	7,13,250	6,65,675	7,15,450	7,31,350

Table 5.8(b): Year-wise income statement (₹)

Items	1	2	3	4	5
Milk	9,55,500	11,97,000	10,92,000	12,07,500	12,39,000
Sale of gunny bags	2,640	3,375	3,090	3,390	3,480
Sale of manure	10,000	10,000	10,000	10,000	10,000
Year-wise total gross income	9,68,140	12,10,375	11,05,090	12,20,890	12,52,480
Year-wise total recurring expenditure	5,71,625	7,13,250	6,65,675	7,15,450	7,31,350
Year-wise gross profit	3,96,515	4,97,125	4,39,415	5,05,440	5,21,130
Month-wise gross profit	33,043	41,427	36,618	42,120	43,428



A study of the dairy business plan [Table 5.2 to Table 5.8(b)] shows that the entrepreneur can earn nearly ₹3.58 lakh in the first year itself, i.e., ₹29,900 per month, which later increases up to ₹39,480 per month.

Table 5.9: Project details of a business plan for 10 buffaloes

S. No.	Basic assumptions	Units
1.	No. of buffaloes	10
2.	No. of animals/batch	5
3.	Cost of animal (₹/animal)	100,000
4.	Selling price of each culled animal (₹)	30,000
5.	Transportation cost (₹/animal)	2,000
6.	Average milk yield (litre/day)	8
7.	Floor space per adult animal (sq ft)	120
8.	Cost of construction per sq ft (₹)	600
9.	Cost of chaff cutter (power operated in ₹)	60,000
10.	Cost of equipment per animal (₹)	1,000
11.	Insurance premium (per annum)	4%
12.	Veterinary aid/animal/year (₹)	2,000
13.	Feed requirement	
	• Concentrate for maintenance (kg/animal/day)	1.5
	• Concentrate for milk production (kg/kg milk yield)	0.5
	• Green fodder (kg/animal/day)	20
	• Dry fodder/ wheat straw (kg/animal/day)	6
14.	Cost of concentrate feed (₹/kg)	22
15.	Cost of dry fodder (₹/kg)	5
16.	Cost of green fodder (₹/kg)	2
17.	Quantity of concentrate feed in one bag (kg)	50
18.	No. of labourers (one person can manage 10 lactating animals)	1
19.	Salary of each labourer per month (₹)	7,000
20.	Cost of electricity and water/animal/year (₹)	300
21.	Selling price of milk/litre (₹)	52
22.	Selling price per gunny bag (₹)	15
23.	Income from manure (per animal/year in ₹)	1,000
24.	Lactation days	305
25.	Dry days	90



Table 5.10: Buffaloes purchased

Total number of buffaloes	10
Batch 1: animals purchased at the initiation of the project	5
Batch 2: animals purchased after six months of project initiation	5

Table 5.11: Calculation of lactation and dry days

Particulars	Days	Year				
		1	2	3	4	5
Batch 1	Dry days	—	—	20	45	70
	Lactation days	270	295	300	300	295
	Dry days	90	70	45	20	—
	Lactation days	5	—	—	—	—
Batch 2	Dry days	—	—	—	—	—
	Lactation days	180	90	115	195	220
	Dry days	—	90	90	90	90
	Lactation days	—	185	105	80	75
Total for a pair of animals	Lactation days	455	570	520	575	590
	Dry days	90	160	155	155	160
Yield of two animals (in litre)		3,640	4,560	4,160	4,600	4,720

Table 5.12: Year-wise feed requirement (kg) for different categories of animals

Feed	Animal	Year				
		1	2	3	4	5
Concentrate (kg)	Milch	12512.5	15675	14300	15812.5	16225
	Dry	675	1200	1162.5	1162.5	1200
Green fodder (kg)	Milch	45500	57000	52000	57500	59000
	Dry	9000	16000	15500	15500	16000
Straw (kg)	Milch	13650	17100	15600	17250	17700
	Dry	2700	4800	4650	4650	4800

Table 5.13: Year-wise milk production (kg) and availability of gunny bags

Item	1	2	3	4	5
Milk	18200	22800	20800	23000	23600
Gunny bags	176	225	206	226	232

Table 5.14: Economics of dairy project for a unit of 10 buffaloes for five years

Capital expenditure	Rate (₹)	Units available with the entrepreneur	Total (₹)
Cost of construction of sheds	600	1200	7,20,000
Cost of buffaloes	1,00,000	10	10,00,000
Transportation cost of buffaloes	2,000	10	20,000
Cost of equipment			
Farm implements (bucket, rope, etc.)	1,000	10	10,000
Cost of chaff cutter (power operated)	—	—	60,000
Total capital expenditure	—	—	18,10,000
Total project cost is ₹ 18.1 lakh			

Table 5.15(a): Year-wise recurring expenditure statement (₹)

Items	Year				
	1	2	3	4	5
Feed					
Cost of concentrate	2,90,125	3,71,250	3,40,175	3,73,450	3,83,350
Cost of green fodder	1,09,000	1,46,000	1,35,000	1,46,000	1,50,000
Cost of straw	81,750	1,09,500	1,01,250	1,09,500	1,12,500
Cost of health coverage for buffaloes	15,000	20,000	20,000	20,000	20,000
Labour charges	84,000	84,000	84,000	84,000	84,000
Electricity and other charges	3,000	3,000	3,000	3,000	3,000
Cost of insurance premium for buffaloes	40,000	40,000	40,000	40,000	40,000
Total recurring expenditure	6,22,875	7,73,750	7,23,425	7,75,950	7,92,850

Table 5.15(b): Year-wise income statement (₹)

Items	1	2	3	4	5
Milk	9,46,400	11,85,600	10,81,600	11,96,000	12,27,200
Sale of gunny bags	2,640	3,375	3,090	3,390	3,480
Sale of manure	10,000	10,000	10,000	10,000	10,000
Year-wise total gross income	9,59,040	11,98,975	10,94,690	12,09,390	12,40,680
Year-wise total recurring expenditure	6,22,875	7,73,750	7,23,425	7,75,950	7,92,850
Year-wise gross profit	3,36,165	4,25,225	3,71,265	4,33,440	4,47,830
Month-wise gross profit	28,014	35,435	30,939	36,120	37,319



Institutional help for dairy farming

There are various government and private schemes for the development of the dairy sector and marketing of milk. Few of them run by the Government of India are as follows.

- Livestock Insurance Scheme
- National Programme for Bovine Breeding (NPBB)
- National Programme for Dairy Development (NPDD)
- National Livestock Mission
- National Dairy Plan
- National Bank for Agriculture and Rural Development (NABARD)
- Dairy Entrepreneurship Development Scheme
- National Kamdhenu Breeding Centre (NKBC)
- *Rashtriya Gokul Mission* (RGM)
- *E-pashu Haat*

Practical Exercise

Activity

Prepare a business plan for starting a dairy business.

Material required: writing material and calculator

Procedure

- Gather information about various inputs required for setting up a dairy farm.
- Calculate the quantity of inputs required for the farm.
- Estimate the expected milk output from the dairy unit.
- Prepare a business plan to run the farm in your notebook.
- Present it before the class.

Check Your Progress

A. Multiple Choice Questions

1. The characteristics of an entrepreneur is/are _____.
 - (a) takes initiative
 - (b) persistent
 - (c) systematic planner
 - (d) All of the above
2. Which of following condition(s) is true in case of a dairy entrepreneur?
 - (a) Income is seasonal
 - (b) Gets income once a year
 - (c) Gets income throughout the year
 - (d) None of the above

NOTES

- Dairy farming is _____ in nature.
(a) capital intensive (b) labour intensive
(c) management intensive (d) All of the above
- What are the different components of Agri Business Incubation?
(a) Entrepreneurship development programme
(b) Incubation
(c) Consultancy
(d) All of the above

B. Fill in the Blanks

- _____ is a situation involving exposure to danger and consequent losses.
- In India, bullocks are mainly used for _____ purposes.
- The time from the end of lactation until the cow or buffalo gives birth is called _____ period.
- Fodder availability remains excess during _____ season.
- Dairy animals can economically produce milk only up to _____ lactations.

C. Mark 'True' or 'False'

- After the completion of training, the entrepreneurs are ready for the implementation stage.
- Agricultural income is seasonal in nature as farmers receive income only on the harvesting of crops.
- Efficient marketing of milk does not play a major economic role in dairying.
- Dry period is the period from the end of lactation till the animal gives birth.
- An entrepreneur must have self-confidence and risk taking attitude.

D. Match the Columns

- | A | B |
|---------------------|--|
| 1. Entrepreneur | (a) Involves exposure to danger and consequent losses |
| 2. Agriculture | (b) The time from calving until an animal dries off |
| 3. Risk | (c) Equipment and machine |
| 4. Lactation period | (d) Mobilises resources to earn profits and generate job opportunities |
| 5. Chaff cutter | (e) Seasonal income |



SESSION 2: MARKETING OF INPUTS AND OUTPUTS IN DAIRY BUSINESS

Market information about inputs required in a dairy farm

For efficient and economic milk production, timely purchase of inputs at reasonable rates is essential. As milk and milk products are perishable in nature, they cannot be kept in a farm unsold for a long period. Therefore, their immediate disposal is important. The inputs required to run a dairy farm are mentioned in Table 5.16.

Table 5.16: Dairy farm inputs and their characteristics

Inputs	Characteristics
Feed and feed supplements	These are the major inputs required in a dairy farm. But they incur the maximum cost. The purchase of feed and feed supplements depends on the number of animals, stage of their life cycle (lactation and pregnancy stage), work performed by them (if it is a milch or draft animal), gender, etc.
Medicines and other chemicals	Medicines are needed to cure animals of various diseases and infections. Some chemicals like cleaning agents, etc., are also needed.
Equipment and tools	A number of tools are required — from milking utensils to transportation vehicles — to run a dairy farm.
Workforce	Services like veterinary, equipment repair and maintenance, etc., are needed in the farm for which efficient workforce is required.

Market updates with special focus on e-marketing

Information is required at all levels in the marketing channel. Before an entrepreneur decides to process and market a dairy product, it is important to know the potential market for each product, to ensure when, where and how much of each product is to be manufactured and marketed. Therefore, it requires securing and utilising marketing information that must address the factors as given in Fig. 5.5. In the absence of a comprehensive marketing information system, short market survey or consumer studies are useful tools for gathering such information.



Fig. 5.5: Marketing information



NOTES

E-marketing provides the dairy farmer with an opportunity of buying and selling products online, and getting information and services on the Internet and other online platforms. It includes use of a company website in conjunction with online promotional techniques, such as search engines, banner advertising, direct e-mail and links or services from other websites. E-marketing is an economical and quick way to promote milk products. In online business, one can buy or sell products 24×7 round the year without employing anyone. E-marketing websites provide one with flexibility, efficiency and security of e-paying taxes, fee, renewal of licences, etc.

Marketing of milk and milk products

The following pricing mechanisms are adopted in the country for the sale of milk and milk products.

Price based on fat and SNF

The percentage of fat and Solid Not Fat (SNF) is a basis for setting the price of milk and milk products.

Open market based price

Another important way to fix the price of milk and milk products is to set the price at par with the price prevailing in the market.

Input based pricing or mark-up price

In this price mechanism, the total cost of inputs is calculated and a reasonable profit is added. We already know that the main buyers of milk and milk products can be the neighbourhood, open market or local collector or shops, local dairy or cooperative society, local processors like sweet shops, caterers, hotels, etc. The selection of a buyer depends on the demand and supply condition. If the village has an active cooperative society, which collects milk and provides facilities and services to the members, then the farmers must become its members and sell the milk to it.



Other options include selling milk to the neighbourhood and in the open market. Whatever the option, it needs to have a regular client base as milk is a perishable commodity. During lean period, there can be low demand so the possibility of selling milk to other markets can be explored. Similarly, during festive season, there can be high demand. A portion or extra milk can be sold to other processors like sweet shops, caterers, hotels, etc., at a remunerative price. Since milk is perishable in nature, it can be processed and sold in the form of milk products like curd (*dahi*), thickened milk (*khoa*), cottage cheese (*paneer*), ghee, etc.

Ways of marketing produce

Milk is a perishable commodity and subject to changes in price. The price elasticity of milk is high. Therefore, attracting a remunerative market price is a challenging task. For fetching such a price, the owners must keep the following in mind (see Fig. 5.6).

Delivery at buyer's doorstep

Convenience is an important factor for fetching the market price of a product. This practice is adopted by a large number of small dairy farmers in the country.

Maintaining reputation

Once the quality and hygiene of milk and milk products are established, people are ready to buy them at a premium price.

Regular and timely delivery

Milk is required daily in every household. Timely and regular service can help fetch the desired market price.

Selling milk products

Selling milk products like ghee, *dahi*, paneer, etc., to regular buyers is an added advantage. Thus, the farmer finds new buyers in the existing consumer base, thereby, reducing extra effort and cost.

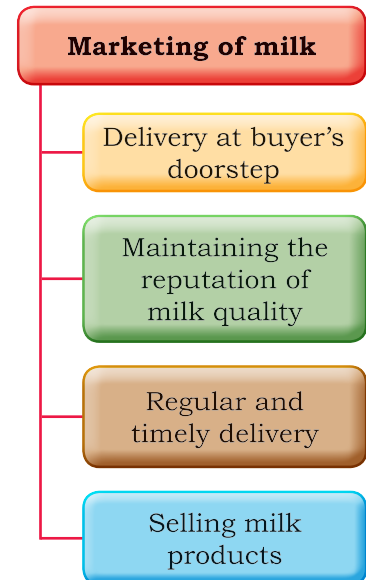


Fig. 5.6 Important aspects of marketing of milk



Fig. 5.7: Clients of a dairy farm

Developing confidence among market players

The various clients of a dairy farm are shown in Fig. 5.7.

Financier

Finance is the backbone of any business. Timely and adequate finance is the key to successful business and can be achieved by efficient dealing. It can be maintained by timely repayment of loan, record and document maintenance.

Input suppliers

Cordial relations with suppliers can get the owner a profitable deal. Discounts, quality inputs, timely supply, after-sale services, etc., are the benefits one can derive out of cordial relationship with the suppliers.

In a large dairy farm, these are, usually, the following category of outputs.

- Raw milk
- Milk products
- Organic manure (Farm Yard Manure, vermicompost, compost, etc.)
- Surplus animals
- Culled animals
- Carcass

Dairy workers

They are the people, who work at the farm and perform various operations — from cleaning to milking. Cordial relations with labourers help in retaining them and result in less absenteeism. Besides, the workers also develop empathetic behaviour towards the animals. Time-to-time incentives and rewards motivate them to work harder.

External services

On many occasions, expert advice of a veterinarian is required for regular animal welfare and in case of an emergency. Details of the facility and service management need to be maintained and be accessible to those working in the farm at all times. Besides, services of engineers are required for the maintenance of machines

Buyers

There can be a variety of buyers. Various category of buyers are shown in Table 5.17.



Table 5.17: Category of buyers

Buyers of milk and milk products	Buyers of organic manure	Buyers of surplus and culled animals
<ul style="list-style-type: none"> • People in the neighbourhood • Open market • Local dairy or cooperative society • Local shops, caterers and hotels 	<ul style="list-style-type: none"> • Local famers for crop production • Wholesellers 	<ul style="list-style-type: none"> • Local dairy farmers • Local traders • Traders from other place

Check Your Progress

A. Multiple Choice Questions

- Which of the following is provided by e-marketing websites?
 - Flexibility
 - Efficiency of work
 - Better security for e-paying taxes
 - All of the above
- Milk price in India is, usually, determined by _____.
 - fat % in the milk
 - SNF % in milk
 - both (a) and (b)
 - None of the above
- Which of the following is not a dairy product?

(a) <i>Dahi</i>	(b) Paneer
(c) <i>Khoa</i>	(d) Soft drinks
- Maintaining cordial relations with dairy workers help in _____.
 - retention
 - less absenteeism
 - empathetic behaviour towards animals
 - All of the above

B. Fill in the Blanks

- As milk and milk products are _____ in nature, they cannot be kept unsold for a long period.
- _____ is the backbone of a business.
- During festivals, the demand for milk remains _____.
- The price elasticity of milk is _____.
- _____ is required at all levels in the marketing channel.

NOTES

C. Mark 'True' or 'False'

1. For efficient and economic milk production, timely purchase of all outputs at reasonable rate is essential.
2. E-marketing provides an opportunity of buying and selling products, information and services online.
3. E-marketing is an economical and quick way of promoting milk products.
4. In online business, one cannot sell or buy a product 24×7 without employing anyone.

D. Match the Columns

- | A | B |
|----------------|---|
| 1. Feed | (a) Curing animals of diseases |
| 2. Medicine | (b) Online buying and selling of products |
| 3. E-marketing | (c) Major input in a dairy farm |
| 4. Milk price | (d) Backbone of a business |
| 5. Finance | (e) Fat and SNF |

E. Crossword

			¹ F			² F			
³ P			I	S	H				
⁴ K									
		A	N						

Across

3. Milk is a _____ product, thus, it has to be disposed of as early as possible.
4. It is a kind of milk product.
5. It is a type of milk product.

Down

1. _____ is the backbone of any business.
2. The percentage of _____ is the basis for setting milk price.



GLOSSARY

Aerophobia: *abnormal behaviour in dairy animals, wherein, they swallow air while eating or drinking.*

Anaerobic conditions in silage making: *growth and development of acetic acid producing bacteria that occurs during silage making, leading to fermentation of soluble carbohydrates, thereby, producing acetic acid.*

Barn: *building in a dairy farm used for various purposes, such as housing the livestock. Sometimes, a barn is also used for storing fodder, grains and equipment.*

Biogas: *gaseous fuel, including methane, produced after the fermentation of organic matter, such as animal farm waste and dung.*

Cannula: *a tube inserted into the body of an animal for the removal of harmful fluids and gases. It is also used for reducing bloating in animals.*

Castration: *depriving animals of their reproductive function either by removing the reproductive organs or making them dysfunctional in males.*

Colostrometer: *a device placed in a cylinder, containing colostrum, used for measuring specific gravity in milligrams per millilitre (mg/ml) of immunoglobulins (Ig).*

Colostrum: *a thick yellowish fluid secreted by the mammary glands of a cow or buffalo during parturition. It is rich in antibodies and minerals, and precedes the production of true milk.*

Concentrate: *feed that are easily digestible, high in energy and low in fibre.*

Cross-breeding: *crossing indigenous animals with foreign breeds.*

Culling: *the process of removing unproductive animals (aged, non-yielding, and sick) from a herd.*

Dam: *mother in case of dairy animals.*

Dehorning: *the process of removing horns in animals and preventing their growth.*

Dental pad: *a feature found in ruminants, lacking the upper incisors. Dental pad and tongue help in grasping fodder.*

Dentition: *the study of configuration of teeth with reference to their time of eruption through gums.*

Dry period: *the period from the end of lactation until the cow or buffalo gives birth.*

Ectoparasites: *organisms that live on the skin of farm animals, causing detrimental effect to their skin and health.*

Electrocution: *accidental injury or death of an animal after suffering an electric shock or current.*

Enema: *a treatment used for curing constipation in farm animals.*

Ensiling: *the process of conserving green fodder for later use.*

Exotic animals: *animals developed and reared in foreign countries. The two important exotic cow breeds in India are Jersey and Holstein Friesian.*

NOTES

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

Forage: plants or parts of a plant, mainly leaves and stem, eaten by domestic animals. It is eaten by the animals directly as pasture, crop residue or immature crops. It also includes hay and silage.

Gestation period: the period of development of foetus inside the womb of an animal between conception and birth.

Gonads: commonly, known as sex glands. In females, the reproductive cells are the egg cells, whereas, it is the sperm cells in case of males.

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

Herbage: herbaceous plants, whose edible parts are grazed by cattle.

Hypothermia: a problem in dairy animals related to heat stress, mainly observed in tropical and subtropical regions. It is manifested by high body temperature.

Incisors: the frontal teeth in ruminants only on the bottom jaw. The front of the upper jaw is a hard dental pad without teeth.

Immunoglobulins: antibodies produced by plasma cells (white blood cells) present in the colostrum. These strengthen a calf's immune system.

Kicking trap: a trap used to control aggressive milch animals that do not permit milking. A kicking trap is tied on the hind quarter of an animal before milking, allowing the milker to milk the animal.

Lactation period: the period from calving till the dairy animal is dried off, i.e., the time during which it is producing milk.

Mastication: the first step in breaking the feed by chewing. Mastication softens the feed and makes it easy for swallowing.

Milker: animal that produces milk or the person who milks the animal, depending on the context of use.

Milk fever: a metabolic disorder in dairy animals, when they are close to calving. It is caused by low blood calcium levels (hypocalcaemia) few days before or after calving. The affected animals suffer from tremors in the muscles of the head and limbs. They, then, go down to sitting position, and finally, lie flat on their side before circulatory collapse, coma or death. The animal needs to be treated as soon as possible by administering Calcium borogluconate solution (300 ml or more).

Milking: the act of drawing milk from dairy animals for human consumption.

Milk let-down: the process by which dairy animals release milk.

Milkman's knot: rope trap used to control dairy animals from kicking while milking. A milkman's knot is tied on an animal's hind legs to ensure unhindered milking.

Milk stage in fodder crops: a stage when the covering of a seed is green, and it contains liquid and milky starch.

Molars: large, flat teeth at the back of the mouth of ruminants. They help in grinding the food while chewing.



Mucometra: a condition when mucus is accumulated in the endometrial cavity of uterine horns with a thin uterine wall, resulting in the suppression of estrous cycle.

Mucus: a slippery, thick and sticky substance that coats, protects and moistens the linings of body passages like in nose, lungs and intestines. It is produced from cells found in the mucous glands.

Nymphomania: a vice common in high-yielding cows. Nymphomaniac cows behave like bulls and mount on other cows. However, they refuse to stand for being mounted by others.

Open period: the stage from calving to re-conception.

Oesophagus: a muscular tube, which connects mouth to the stomach in dairy animals.

Oxytocin: a neurohormone, whose main functions are to stimulate contractions of the uterus during labour and ejection of milk let-down during lactation in female animals. It also promotes maternal nurturing behaviour in them.

Paddock: a small enclosed field, often for grazing or training horses, usually, near a shed.

Parturition: the process of giving birth in animals. It occurs at the end of pregnancy.

Persistency of milk yield: the rate of change in yield between two different time intervals. Low individual persistency at any stage of lactation may be caused by various environmental, reproductive and health related factors.

Placenta: an organ that develops in an animal during pregnancy. It facilitates exchange of nutrients and wastes between the blood of the mother and fetus.

Prehension: the action of grasping or seizing food into the mouth by an animal. Cattle graze feed with the help of tongue.

Premolars: permanent teeth that come before molars in case of cattle. Premolars are used to crush and grind the feed.

Posterior pituitary: also called 'master gland', it produces hormones that regulate the functions of other important endocrine glands. Pituitary gland is divided into two parts — anterior and posterior. The posterior pituitary gland produces oxytocin hormone, which helps in milk let-down.

Purgatives: substances that are used to treat and prevent constipation and impaction in farm animals.

Pyometra: accumulation of pus in the uterus of animals. The affected animals do not exhibit any systemic sign of illness.

Rendering: the processing of a dead animal's body parts into useful products.

Reticulum: the second chamber in the alimentary canal of a ruminant. This, along with rumen, makes up 84 per cent of the total stomach volume.

Roughage: feed high in fibre (cellulose) that is less digestible and low in energy.



NOTES

Rumen: the first stomach in ruminants like cows and buffaloes that receives food or cud from oesophagus, and partly digests and passes it to the reticulum.

Rumen fistula: a tube having two ends, with one end inserted in the rumen of an animal and the other attached to a plug.

Ruminants: mammals having four compartments in the stomach — rumen, reticulum, omasum and abomasum.

Silage: fodder that is fermented and preserved in high moisture conditions, and usually, fed to ruminants.

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

Streak canal: entrance to the udder. Streak canal is surrounded by a band of muscle tissues that keep the canal closed.

Sphincter muscles: circular muscles that maintain constriction of body passage or orifice and relax when required for normal physiological functioning. When a dairy animal is milked, these muscles relax, allowing the orifice of the teat to open. The sphincter muscles always take some time to constrict the teat after milking.

Suturing: a process, in which a stitch is made to join the open parts of a wound in farm animals. It is, especially, done after an animal is operated upon.

Teat: nipple of the mammary gland in case of cows and buffaloes from where milk is suckled by a calf.

Tedding: a process, in which newly cut hay is spread out for drying.

Trocar: a veterinary surgical instrument used for withdrawing gases and fluids from the body of an animal.

Tympany: abnormal distension of rumen and reticulum caused by accumulation of gases in the rumen.

Udder: mammary gland in female cattle. The udder of cows and buffaloes has four teats.

Ultrasonography: the practice of using high-frequency (ultrasound) waves to produce an image for veterinarian analysis of an animal.

Ultrasound: a technology used for pregnancy detection, examining ovarian and other functions in farm animals.

Weaning: the process of separating a calf from the dam within few days of birth.



ANSWER KEY

Unit 1: Conservation of Forages

Session 1: Fodder Crops and their Harvesting

A. Multiple Choice Questions

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

B. Fill in the Blanks

1. *Sorghum bicolor* 2. *dhurrin* 3. 60–70
4. *Medicago sativa* 5. Cowpea

C. Mark 'True' or 'False'

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

D. Match the Columns

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

E. Crossword

Across

1. *Rabi* 3. *Kharif*
4. *Bajra* 5. Cowpea

Down

2. Barley

Session 2: Methods of Conservation of Forages and Assessing their Quality

A. Multiple Choice Questions

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

B. Fill in the Blanks

1. Hollow 2. 85 3. 60 to 70
4. greenish yellow 5. yellow, green

C. Mark 'True' or 'False'

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

D. Match the Columns

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

E. Crossword

Across

1. Baled 2. Curing 3. Green 4. Sickle

Down

1. Butyric

NOTES

Unit 2: Maintaining Healthy Performance of Livestock Session 1: Maintaining the Well-being of Dairy Animals

A. Multiple Choice Questions

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

B. Fill in the Blanks

1. welfare 2. Wind sucking 3. nymphomaniac
4. castration or endocrine implant
5. milkman's knot, kicking trap

C. Mark 'True' or 'False'

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

D. Match the Columns

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

E. Crossword

Across

1. Freedom 2. Vice

Down

3. Aerophagia 4. Sick

Session 2: Prevention and Control of Parasitic Infections

A. Multiple Choice Questions

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

B. Fill in the Blanks

1. Ectoparasites 2. blood 3. diseases
4. backline 5. subcutaneous

C. Mark 'True' or 'False'

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

D. Match the Columns

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

E. Crossword

Across

2. Morning 4. Fly 5. Hair

Down

1. Parasite 3. Worm

Session 3: Management Practices for maintaining Animal Productivity

A. Multiple Choice Questions

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



B. Fill in the Blanks

1. Dehorning 2. ear tags 3. 310 4. 21

C. Mark 'True' or 'False'

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

D. Match the Columns

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

E. Crossword**Across**

4. Teaser

Down

1. Starter 2. Heat 3. Weaning 5. Record

Unit 3: Performing Hand and Machine Milking**Session 1: Structure of the Udder, Milk Let-down and Milking of Dairy Animals****A. Multiple Choice Questions**

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

B. Fill in the Blanks

1. sweat 2. hormonal 3. adrenalin
4. left 5. six to eight

C. Mark 'True' or 'False'

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

D. Match the Columns

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

E. Crossword**Across**

5. Adrenalin

Down

1. lukewarm 2. stripping 3. sweat 4. milk

Session 2: Clean Milk Production and Prevention of Mastitis in Dairy Animals**A. Multiple Choice Questions**

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

B. Fill in the Blanks

1. Sick 2. Grooming 3. Abnormal 4. diseased

C. Mark 'True' or 'False'

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



NOTES

D. Match the Columns

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

E. Crossword

Across

3. Dome 4. Grooming 5. Mastitis

Down

1. Fore milk 2. Somatic

Unit 4: Maintaining Health and Safety Standards at the Workplace

Session 1: Hygiene and Biosecurity at a Dairy Farm, and Disposal of Carcass

A. Multiple Choice Questions

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

B. Fill in the Blanks

1. Biosecurity 2. 100 3. Incinerator
4. Rendering 5. burial

C. Mark 'True' or 'False'

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

D. Match the Columns

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

E. Crossword

Across

3. Composting 4. Burial 5. Phenol

Down

1. Rendering 2. Apron

Session 2: First Aid for Dairy Animals

A. Multiple Choice Questions

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

B. Fill in the Blanks

1. sick 2. Poisoning 3. vagina
4. 150–300 5. Potassium permanganate

C. Mark 'True' or 'False'

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

D. Match the Columns

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



E. Crossword**Across**

1. Prolapse 3. Burn 4. Tympany 5. Wound

Down

2. Poisoning

Unit 5: Entrepreneurship**Session 1: Fundamentals of Entrepreneurship in Dairy Business****A. Multiple Choice Questions**

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

B. Fill in the Blanks

1. Risk 2. draft 3. dry 4. rainy 5. five to six

C. Mark 'True' or 'False'

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

D. Match the Columns

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

Session 2: Marketing of Inputs and Outputs in Dairy Business**A. Multiple Choice Questions**

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

B. Fill in the Blanks

1. perishable 2. Finance 3. high
4. high 5. Information

C. Mark 'True' or 'False'

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

D. Match the Columns

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

E. Crossword**Across**

1. Finance 2. Fat

Down

3. Perishable 4. Khoa 5. Paneer



SUGGESTED READINGS

Books

BANERJEE, G. C. 1998. *Textbook of Animal Husbandry. 8th Ed.* Oxford and IBH Publication, New Delhi.

ICAR. 2002. *Handbook of Animal Husbandry.* 3rd Ed. ICAR.

JAGDISH, PRASAD AND N. S. NIRAJ. 2007. *Principles and Practices of Dairy Farm Management. 5th Ed.* Kalyani Publishers, Ludhiana.

ROY, BISWAJIT AND SUDIPTA GHOSH. 2015. *Dairy Animal Production.* IBDC, Lucknow.

SINGH, RAMADHAR. 2009. *Essentials of Animal Production and Management.* Kalyani Publishers, Ludhiana.

THOMAS, C. K. AND N. S. R. SASTRY. 1991. *Dairy Bovine Production.* Kalyani Publishers, Ludhiana.

_____. 2006. *Livestock Production and Management.* Kalyani Publishers, Ludhiana.

Websites

<http://www.ivri.nic.in>

<http://www.nbagr.res.in/>

<http://www.ndri.res.in>

<https://agriculture.gov.in>

<https://dahd.nic.in>

<https://www.nabard.org>

www.fao.org

www.icar.org.in

www.nianp.res.in/

www.tanu.edu

<http://www.igfri.res.in>