UNIT 2 MINIMUM WELFARE STANDARDS FOR DAIRY ANIMALS - HOUSING

Structure

2.1 LEARNING OUTCOMES

a) Knowledge and Understanding: After studying this Unit you will be able to:

- Explain the meaning, importance and types of housing in improving animal welfare.

b) Practical and Professional Skills: After studying this Unit you will be able to:

- Describe the importance of housing of dairy animals, the minimum standards and good practices for the housing of dairy animals.

2.2 INTRODUCTION

In the previous unit, we discussed welfare standards and good practices for breeding and husbandry of dairy animals. All animals require shelter for protection and comfort in order to remain healthy and perform better. The animals are to be protected from too high and too low temperature, strong sunlight, heavy rainfall, high humidity, frost, snowfall, strong winds, ecto-parasites and endo-parasites. Inadequate housing and ventilation, overcrowding and uncomfortable conditions

on the other hand are considered to have detrimental effects on welfare of housed animals which makes them not only more susceptible to infectious diseases but also less productive.

Housing conditions also have a significant impact on the welfare of dairy cattle. Dairy cattle and buffaloes in India are housed mainly under housing systems that may include loose housing or tie stalls, each with or without outdoor and/or pasture access. Each type of these housing systems has advantages and disadvantages. The welfare of dairy cattle depends not only on the specific housing system, but also on the management of a particular system. The housing systems and other farm structures should be designed, constructed, maintained and managed to assist in the achievement of the Five Freedoms of the animals. In order to maximize their performance and to ensure satisfactory standards of welfare, the animal houses must provide the most basic needs. As an absolute minimum, the housing must provide a comfortable, clean, well drained and dry lying area together with shelter for protection from inclement weather conditions to the animals. It must allow the animal to move freely around without risk of injury and certain diseases.

Keeping the above in view, this unit introduces you to the concept, types, standards and good practices in housing of dairy animals.

2.3 HOUSING SYSTEMS

Mainly there are two systems of housing for dairy animals:

- Loose housing system and
- Conventional closed housing system.

2.3.1 Loose Housing

In loose housing, animals are usually kept loose in an open paddock in groups of 40–50 throughout the day and night except during milking and some other specific purposes like treatment, breeding etc. when the animals are required to be tied. This housing system generally provides continuous manger along with covered standing space, open paddock which is enclosed by brick wall or railing and common water trough. Separate housing structures of calf pens, milking byres, calving pens, bull pens etc. are required for this system. This system is ideal for areas of low rainfall such as Punjab, Haryana Rajasthan, western Uttar Pradesh and parts of Gujarat, Madhya Pradesh and Maharashtra. Even at other places this system can be used after making suitable modifications, so as to protect animals from excessive rains. Such houses are:

- Cheaper to construct
- Easier to expand at short notice
- More congenial to efficient management
- Less labour
- Less prone to fire hazards to animals, and
- Helpful in clean milk production

2.3.2 Close (tie) Housing

In this system the animals are tied at one place throughout. Milking and other routine operations connected with dairy animals are also carried out at this very place. This conventional closed system provides greater protection during winter season, needs less floor space but the construction cost is high. There are two types of designs in the system:

- Tail-to tail system
- Face-to-face system

In tail-to-tail system, which is mostly favoured, the animals do not face each other and their feeding mangers are different. On the other hand in face-to-face design, the manger is common. In tail-to-tail system, the dairy farmer can feed the animals on individual basis.

Before we proceed, please complete activity 1.

Activity 1 (Visit): Visit a nearby dairy farm and discuss with the farmer the housing system followed along with advantages and limitations. Write your observations.

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Check Your Progress 1

Note: a) Use the spaces given below for your answers.

b) Check your answer with those given at the end of the unit.

1) Write the importance of housing in welfare of dairy animals.

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2. Name the two systems of housing for dairy animals.

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2.4 MINIMUM STANDARDS FOR HOUSING OF DAIRY ANIMALS

The minimum standards for housing as per National Code of Practices for the Management of Dairy Animals are summarised in Box 2.1.

Box 2.1: Minimum Standards for Housing of Dairy Animals

1) The housing system selected must ensure adequate climatic protection and comfort to the housed animals for promoting optimum production, health and expression of innate behaviour.
2) The floor space, feeding and watering space available for each animal must meet the standing, resting, loafing, and exercise, feeding and watering requirements of the dairy animal.
3) The number of animals in each group of animals in loose house must not be more than the ability of the animal to recognise their hierarchy for ensuring social stability in the group.
4) The floors in dairy animal houses must allow for comfortable sitting, standing up, traction and insulation from ground.
5) The animal passages, roads, alleys and walk ways must allow for easy movement with good traction.

Source: Kamboj et al., 2014

The recommended good practices under each minimum standard are discussed below for your comprehension.

2.4.1 Minimum Standard 1

The housing system selected must ensure adequate climatic protection and comfort to the housed animals for promoting optimum production, health and expression of innate behaviour.

2.4.1.1 Recommended Good Practices

- Dairy animals should preferably be housed under loose houses for improved productivity, better comfort, welfare and health of the housed animals.
- Close housing may be practiced in regions of prolonged heavy rainfall and high temperate areas.
- Dairy animals should not be kept tied round the clock. In case of tying, they should be let loose in a yard for a period of 2–4 hours daily for exercise and

socializing or should have an access to grazing area for a period of 2–4 hours daily.

- When animals are kept tethered, the ropes or chains used for tethering should be long enough to allow the animal sufficient space for sitting and standing, self grooming and turning round with a space of at least 4 ft between two adult cows or buffaloes.
- Tethered animals should be offered good quality fresh water for 3–6 times daily depending on climatic conditions.
- Tethered cows and buffaloes should be untied and allowed exercise at least once a day and offered feed and water if it is a long exercise period. The animals should also be able to groom themselves when tethered.
- The orientation of shelter is to be such that it can give maximum protection to the animals. In coastal areas, the sheds shall be oriented across the prevailing wind direction in order to protect the roof from being blown off by high wind and at the same time, to provide sufficient air movement in the shed. In humid regions, buildings should be so sited as to avail natural aeration and sunlight. The orientation of the structure shall be east to west in coastal areas and north to south in hot dry areas.
- In regions where temperatures average 30°C or more for up to five hours per day, during some period of the year, the east-west orientation is the most beneficial.
- Shelters and housing must be located away from areas of run off or in low lying areas. They must be well ventilated and allow fresh air and natural light to enter. Air circulation, dust levels and gas concentrations shall be kept within limits which are not harmful to the animals.
- Animals must not be subjected to dim lighting or kept in permanent darkness.
- The system of housing should be such that the animals are able to see each other, their feedstuffs and water sources, as well as their surroundings clearly.

2.4.2 Minimum Standard 2

The floor space, feeding and watering space and air space available for each animal must meet the standing, resting, loafing, exercise, feeding, watering and ventilation requirements of the dairy animal.

2.4.2.1 Recommended Good Practices

- The shelter for dairy animals is such that it should give them shelter and enough space to move around and interact with each other.
- The shelter should provide enough space for a subordinate animal (young/ weak animal) to move away from a dominant one (adult/strong).
- It is important to provide as comfortable an area as possible, so that the animals can lie down for as long as they want and have enough space to stand up again.
- The lying area should be big enough to help keep the cows clean and comfortable and to avoid them damaging their joints.
- The space allowance for cattle and buffaloes housed in groups should be worked out in terms of the whole animal environment keeping in view the

age, sex, live weight and behavioural needs of the stock and size of the group.

The minimum allowances for floor space, feeding space and watering space for different categories of dairy animals in loose system of housing and for an average farmer in tie stalls (as per BIS recommendations) are presented in Tables 2.1, 2.2 and 2.3, respectively.

Table 2.1: Floor space requirements of dairy animals under loose housing system (IS 12237-1987)

Sl. No.	Type of animal	Floor space per animal (m^2)		Feeding (manger) space/ animal (cm)	Water trough space/ animal (cm)
		Covered Area	Open Area		
1	Young calves (< 8 weeks)	1.0	2.0	40–50	10–15
2	Older calves (≥ 8 weeks)	2.0	4.0	40–50	10–15
3	Heifers	2.0	4.0–5.0	45–60	30–45
4	Adult cows	3.5	7.0	60–75	45–60
5	Adult buffaloes	4.0	8.0	60–75	60–75
6	Down calvers	12.0	20–25	60–75	60–75
7	Bulls	12.0	12.0	60–75	60–75
8	Bullocks	3.5	7.0	60–75	60–75

Table 2.2: Floor space norms for cattle shed for an average farmer keeping small number of animals in tie stalls (IS 11786 -2005)

No. of cattle	Cow shed		Buffalo shed	
	Length (m)	Width (m)	Length (m)	Width (m)
1	2.5	3.0	2.7	3.4
2	4.2	3.0	5.2	3.4
3	5.7	3.0	7.3	3.4
4	5.6	3.0	6.8	3.4
Calve	2.0	1.5	2.4	1.9

Table 2.3: Tie-stall system dimensions (metres) as per FAO (2010)

Stall Section	Cow Live Weight		
	450 kg	550 kg	650 kg
Stall width	1.1	1.2	1.3
Stall length	1.6	1.7	1.8
Manger width	0.5	0.6	0.65

- In loose cattle houses the length of feeding space should enable all the animals in the shed to eat at the same time to avoid aggression during feeding.
- Feed and water troughs should be designed and located where the animals cannot get into them so that the troughs are kept clean.
- Where feed and water troughs are provided in the loafing area, the access areas should be sufficiently wide to permit free movement of animals and prevent routes becoming wet and slippery.

The feeding and watering space requirement as per BIS are given in Table 2.1 and their dimensions are presented in Table 2.4.

Table 2.4: Dimensions of the mangers and water troughs

Type of animal	Dimensions of manger/water trough (cm)		
	Width	Depth	Height of inner wall
Adult cows and buffaloes	60	40	50
Calves	40	15	20

The minimum linear perimeter of water trough for a given number of animals in the herd as recommended by the Royal Society for the Prevention of Cruelty to Animals (RSPCA), 2011 is given in Table 2.5.

Table 2.5: Minimum linear perimeter of water trough (RSPCA, 2011)

S. No.	Herd size	Minimum effective drinking perimeter (m)
1	50	2.25
2	100	4.50
3	125	5.65
4	150	6.75
5	200	9.00

With the commercialization of dairy farming and high yielding crossbred cows/ buffaloes, the farmers have started constructing individual animal cubicles/free stalls inside the sheds. The dimensions for free stalls (cubicles) as recommended by Farm Welfare Approved standards for dairy cattle and calves (USA) are presented in Table 2.6 for reference.

Table 2.6: Dimensions for free stalls (cubicles)*

Weight of animal (kg)	Cubicle length (ft)	Cubicle width between partitions (ft)
350–500	6.5	3.5
500–600	7.0	3.75
600–700	7.5	4.0

Elevated mangers made up of cement concrete or wood are in use in India predominantly under traditional small holder production system. However,

research in the field has indicated that the elevated mangers are not desirable with regard to the feeding behaviour of the cow, feed utilization and other parameters such as feed wastage and development of abnormal behaviour in cows.

Fence line feeding system which allows access to feed from ground level while preventing the animals from walking and defecating on the feed by using fencing has been found to be more desirable for meeting the natural ingestive behavioural needs. It is also economical to construct and results in saving of labour. The standard dimensions of fence-line feed barriers for different categories of dairy animals are presented in Table 2.7.

Table 2.7: Dimensions of fence-line feed barriers

Sl. No.	Age/category of animal	Throat height (inches)	Height of neck rail (inches)
1	6–8 months	14	28
2	9–12 months	15.5	30
3	13–15 months	17	34
4	16–24 months	19	42
5	Adult cows	21	48

The cattle sheds should get adequate ventilation and should not allow accumulation of excessive carbon dioxide and other gases

- The floor area which is to be covered should be roofed with good insulating and durable material and its height should be decided based on the climatic conditions of the area. In high temperature areas the roof must have a minimum height of 16–18 ft or preferably 20 ft.
- The roofs shall extend at least 2–3 ft from the eaves to allow for added protection from sun and rains.
- The covered and the open areas of the different categories of cows and buffaloes shed should be enclosed by 5 feet high brick walls which are 22.5 cm thick.
- The length of the water trough should be long enough to allow for 10% of the housed animals to drink at the same time.
- The feed and water troughs should preferably be located under the covered area and constructed as per recommended dimensions.
- The water troughs can be made of bricks lined with cement concrete. The inner surfaces of the water troughs should be rounded off and finished smooth and the tops of walls should be arched.
- The water troughs should be provided with railing on their sides so that the animals may not try to step in the water trough and contaminate it.
- The water troughs must be kept thoroughly clean and not result in wetting of bedded areas.

- The feed should be preferably offered through fence-line feeding system constructed as per standard dimensions. The use of elevated mangers should be avoided.
- The farmers need to consider the size and weight of the animals while designing the cubicles. Cubicles should be designed to encourage cows to lie down and stand up easily without injuring themselves.
- The cubicles should be provided with enough bedding to keep the cows comfortable and clean. The number of cubicles should be about 5% more than the number of cows.
- Concrete floors or hard rubber mats without bedding are unacceptable surfaces and compromise the welfare of cows.

Check Your Progress 2

Note: a) Use the spaces given below for your answers.

b) Check your answer with those given at the end of the unit.

1) What are the minimum standards for housing of dairy animals?

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2) Enlist the precautions required to be taken when the animals are kept tethered so that animal welfare is not compromised.

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3) What should be the orientation of housing structure?

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4) Write the good practices related to water troughs at dairy farms.

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2.4.3 Minimum Standard 3

The number of animals in each group of animals in loose house must not be more than the ability of the animal to recognise their hierarchy for ensuring social stability in the group.

- Cattle and buffaloes are highly social herd animals and engage in complex interactions to communicate dominance, subordination and peer bonding within the group.
- These herds have a strict linear hierarchical structure with the most dominant animal at the top and the most subordinate animal at the bottom.
- When different individuals meet for the first time, they fight to establish rank. Once hierarchical structure within a group is established, negative interactions become less common except when animals compete for a limited resource e.g. access to feed, preferred lying areas, access to the milking parlour etc. or when closely ranked animals seek to re-establish or alter the dominance order.
- Near stable social hierarchy gets established in the group when the members of the group are able to recognize each other and remember their rank. An adult cow/buffalo can effectively recognize 40–50 cows/buffaloes. Therefore, in order to ensure social stability in the group and minimize the level of aggression, the group size should be about 50 and should not exceed 60 animals.

The approximate number of animals to be housed together in a group in loose houses is given in Table 2.8.

Table 2.8: Number of animals in a group under loose housing of dairy animals

S.No.	Type of animal	Number of animals
1	Young calves (< 8 weeks)	Individual or in groups of below 5
2	Older calves (8 wks and above)	Groups of below 15
3	Heifers	Groups of below 25
4	Adult cows	Groups of 40–50
5	Adult buffaloes	Groups of 40–50
6	Down calvers	Individual
7	Bulls	Individual
8	Bullocks	Pairs

2.4.3.1 Recommended Good Practices

- Calves to be housed individually for a period of 8 weeks in calf boxes or in groups of 8 calves.
- The calf pens should be spacious, the calf should at least be able to turn around even in an individual pen and they should be frequently cleaned with dry bedding provided.
- The minimum internal dimensions for an individual calf pen are:

- 1200 × 800 mm for a pen where the calf is kept to 2-6 weeks of age
- 1200 × l000 mm where the calf is kept to 6 to 8 weeks of age and
- 1500 × 1200 mm where the calf is kept from 6 to 14 weeks of age.

- The front of the pen should have a gate so that the calf can be fed milk, concentrates and water easily from buckets or a trough fixed outside the pen.
- If calves are housed in individual cages/boxes they should be let loose in an open yard for 2–4 hours daily for exercise and socialization (play/social grooming).
- The animals in an established social group should not be shifted from one group to another very frequently.
- Primiparous cows (pregnant heifers or one time calvers should preferably be housed in separate groups or if they are to be housed in a multiparous group of cows they should be mixed into the group for a short duration daily initially.
- Young males and females should be housed in separate groups near the age of puberty and sexual maturity.
- The herd animals such as cows and buffaloes should not be housed individually and in case individual housing is indispensable, such as in calving pens/boxes, the cows/buffaloes should be able to see each other.
- The surrounding walls/enclosures of individual bull pens should be of such height which enables the bulls to see each other.

2.4.4 Minimum Standard 4

The floors in dairy animal houses must allow for comfortable sitting, standing up, traction and insulation from ground.

2.4.4.1 Recommended Good Practices

- As far as possible complete concrete flooring should be avoided in cattle houses.
- Where floors are made of concrete, about 6 inches thick bedding of paddy straw or other locally available dry crop residues should be used. The other options are the use of cow mattresses, rubber mats, dried slurry from biogas plant, brick kiln ash or sand.
- About one half of the open (loafing area) should preferably be *katcha (earthen)* or sand bedded and the remaining half should be brick paved. The depth of sand bed should be 6–8 inches over a hardened floor. The area of sand of 35 sq ft per cow in a loose house has been found to be appropriate.
- Floors should be made of non-slip material or be maintained so as to reduce the risk of slipping.
- Floors should never be too rough as to cause foot damage nor too smooth as to result in slipping.
- The floors under the roofed area of should be made of RCC or paved with

cement concrete flooring tiles and made non-slippery by making grooves. The grooves shall be formed in square of 15 × 15 cm for adult cows and buffaloes shed and in squares of 10 × 10 cm for the calf shed.

- The floors should have a gradient of 1 in 40 towards the drains. The 'U' shaped drains of 30 cm width and 6 to 8 cm depth should be provided at the ends of covered area with a slope of 1 in 100. Open drains are preferable than closed underground drains which develop frequent blockage.

2.4.5 Minimum Standard 5

The animal passages, roads, alleys and walk ways must allow for easy movement with good traction.

2.4.5.1 Recommended Good Practices

- The animal passages, roads, alleys and walkways should be wide enough to allow for easy movement and their floors should be made of non-slippery material which shall allow good traction.
- The walls of milking cows and milking buffalo paddocks should be 10 feet wide, centrally placed gates opening towards the road. The walls of calf shed, heifer sheds and dry cows and dry buffaloes sheds should have 6 feet wide centrally placed gates opening towards the road.
- All farm premises should have a boundary wall (brick) or fencing (iron railing). The effective height of the outer boundary wall for a calf and an adult may be 1.2 m and 1.5 m, respectively.
- The provision of suitable size gates is also to be made in the boundary wall. The width of the gate leading from sheds to sheds to be about 1–1.2 m. The gate which leads from paddock to road is to be 2.5 m.
- The main gate of the farm premises should be bigger in width i.e. 5.5–6 m for easy entrance and exit of tractors, trolleys and other heavy vehicles.
- The cows are normally assembled in a collecting yard (holding area) before milking. The collecting yard should have a minimum size of 1.1–2.0 m² per cow. Large horned cows and a low herd number will require the largest space per cow.
- Consideration should be given to providing a loading bay and/or ramp that enables animals to walk straight into or out of the vehicle on the level or slight gradient (less than 20% incline).

Before we proceed, please complete Activity 2.

Activity 2 (Visit): Visit a nearby dairy farm and discuss with the supervisor on the five minimum standards for housing of dairy animals as given in Box 2.1. Write your observations.

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Minimum Standard 1

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Minimum Standard 2

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Minimum Standard 3

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Minimum Standard 5

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Check Your Progress 3

Note: a) Use the spaces given below for your answers.

b) Check your answer with those given at the end of the unit.

1) What do you understand by the term social stability in the dairy animal group?

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2) What are the good practices related to bedding material?

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2.5 LET US SUM UP

- In this unit, we discussed the major types of housing systems followed by five minimum standards for housing of dairy animals and good practices.
- Housing conditions have a significant impact on the welfare of dairy cattle.
- The housing systems should be designed, constructed and managed to assist in the achievement of the Five Freedoms of the animals.
- In order to maximize their performance and to ensure satisfactory standards of welfare, housing must provide a comfortable, clean, well drained and dry lying area together with shelter for protection from inclement weather conditions.

2.6 KEY WORDS

Abnormal Behaviour: The behaviours which do not fall into the normal repertoire of behaviours of animals e.g. tongue rolling by cows, cross-sucking by calves.

All-In All-Out: A housing strategy directed at the control of infectious disease. The animal shed is emptied of *all* animals on a particular day and is cleaned and disinfected and then refilled, *all* on the same day e.g. in case of viral pneumonia of calves.

Cow Cubicles: The resting places for individual cows in cattle sheds.

Innate Behaviours: The animal behaviours which are governed by genes e.g. suckling of mothers by calves.

Multiparous Cows: Cows calved more than once.

Primiparous Cows (Heifer Cows): Pregnant for the first time or having given birth once.

Social Hierarchy: The social rank or the dominant position of the animal in a group of animals.

Social Stability: Absence of aggression in a group of animals housed together.

2.7 BIBLIOGRAPHY AND FURTHER READING

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2.8 SELF ASSESSMENT EXERCISES

1) Discuss the purpose of constructing houses for dairy animals.
2) Enlist the minimum standards for housing of dairy animals.
3) What are the minimum feeding and watering space requirements for different categories of dairy animals? Also mention minimum length and width of tie stalls for different weight categories of dairy animal.
4) What is the importance of fence-line feeding system? Also give the standard dimensions for constructing fence-line feed barriers for different categories of dairy animals.
5) Describe the practices for the construction of farm gates, roads and animal walk-ways at dairy farms.

2.9 ANSWERS/HINTS TO CHECK YOUR PROGRESS

Check Your Progress 1

1) Inadequate housing and ventilation, overcrowding and uncomfortable conditions are considered to have detrimental effects on welfare of housed animals which makes them not only more susceptible to infectious diseases but also less productive. Dairy animals require housing for protection and comfort in order to perform better and remain healthy. The animals are to be protected from temperature, strong sunlight, rainfall, high humidity, frost, snowfall, strong winds, parasites etc.

2) The two systems of housing for dairy animals are: loose housing system, and conventional closed housing system.

Check Your Progress 2

1) The minimum standards for housing of dairy animals are: The housing system selected must ensure adequate climatic protection and comfort to the housed animals for promoting optimum production, health and expression of innate behaviour; The floor space, feeding and watering space available for each animal must meet the standing, resting, loafing, and exercise, feeding and watering requirements of the animal; The number of animals in each group of animals in loose house must not be more than the ability of the animal to recognise their hierarchy for ensuring social stability in the group; The floors in dairy animal houses must allow for comfortable sitting, standing up, traction and insulation from ground. The animal passages, roads, alleys and walk ways must allow for easy movement with good traction.

2) When animals are kept tethered, the ropes or chains used for tethering should be long enough to allow the animal sufficient space for sitting and standing, self grooming and turning round and a space of at least 4 ft between two adult cows or buffaloes. Tethered animals should be offered good quality fresh water for 3–6 times daily depending of climatic conditions. Tethered cows and buffaloes should be untied and allowed exercise at least once a day and offered feed and water if it is a long exercise period. The animals should also be able to groom themselves when tethered.

3) The orientation of shelter is to be such that it can give maximum protection to the animals. In coastal areas, the sheds shall be oriented across the prevailing wind direction in order to protect the roof from being blown off by high wind at the same time to provide sufficient air movement in the shed. In humid regions, building should be so sited as to avail natural aeration and sunlight. The orientation of the structure shall be East to West in coastal areas and North to South in the hot dry areas.

4) Water troughs must be cleaned and white washed periodically. Ensure minimum depth of water in the troughs. See that the water is not too hot in summers or too cold in winters. Water trough must be located in the covered area of sheds.

Check Your Progress 3

1) Stable social hierarchy gets established in the animal group when the members of the group are able to recognize each other and remember their respective rank. An adult cow/buffalo can effectively recognize 40–50 cows/ buffaloes. Therefore, in order to ensure social stability in the group and minimize the level of aggression, the group size should be about 50 and should not exceed 60 animals.

2) Where floors are made of concrete, about 6 inches thick bedding of paddy straw or other locally available dry crop residues should be used. The other options are the use of cow mattresses, rubber mats, dried slurry from biogas plant, brick kiln ash or sand.

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