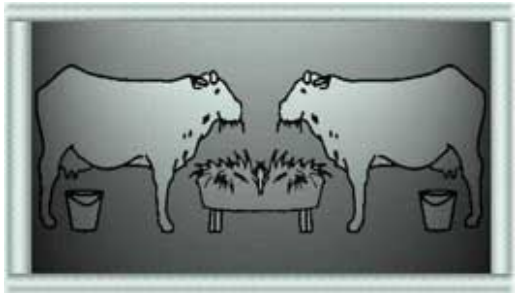

Small-scale

dairy farming manual

Vol. 2

Regional Dairy Development and Training Team
for Asia and Pacific
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Regional Office for Asia and the Pacific
Bangkok, Thailand

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 1993

TABLE OF CONTENTS

Volume 2

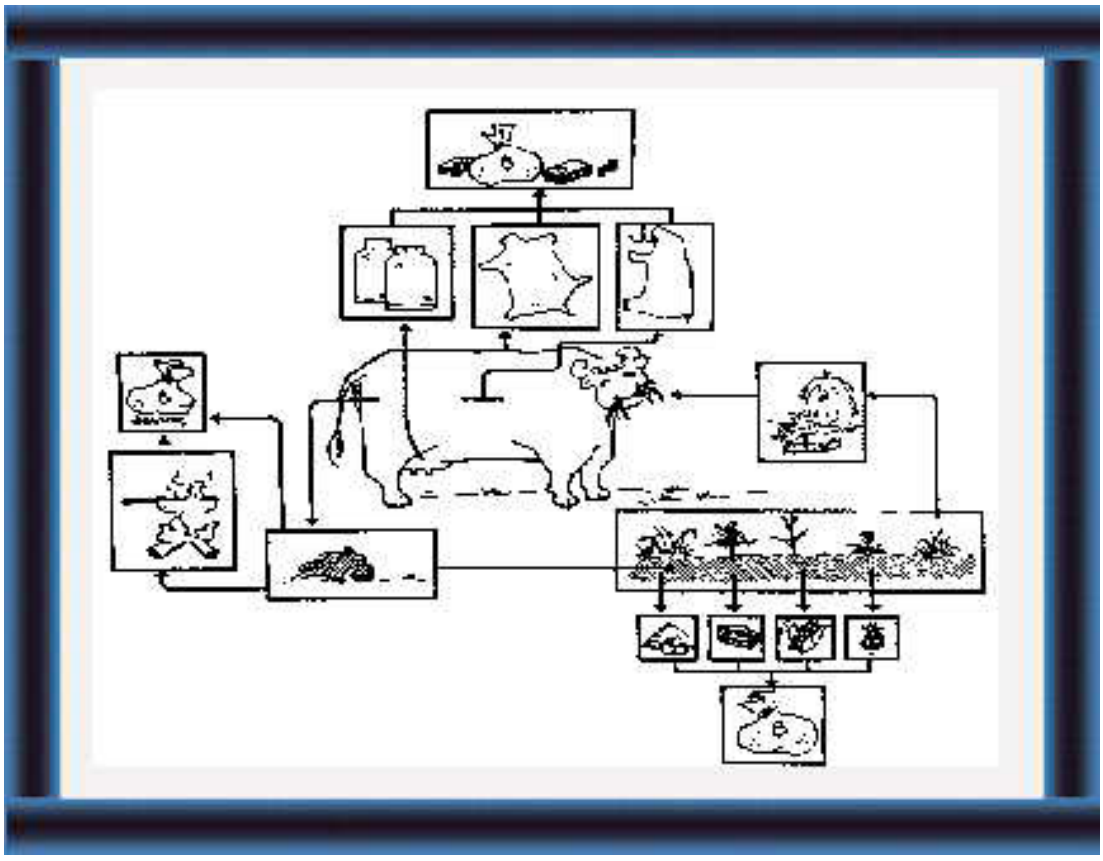
Small-Scale

Dairy Farming Manual

Volume 2

Husbandry Unit 1.1

DAIRYING AS PART OF INTEGRATED FARMING SYSTEMS



DAIRYING AS PART OF INTEGRATED FARMING SYSTEMS

Husbandry Unit 1.1:

Technical Notes

Note: Numbers in brackets refer to illustrations in the Extension Materials.

Introduction

In most countries in the Asian region, ruminant animals, particularly cattle and buffalo, have an important economic role in village farming systems to provide milk, draught power, manure, meat and hides. The relative value of the products varies from country to country in the region and from place to place within a country.

Milk is an important constituent in the diet of large populations in countries like India and Pakistan. Its value is being increasingly recognized in other countries in the region too. Increasing incorporation of milk in the diets of the people in the region focuses attention on the value of milk not only as a source of nourishment for the rural small scale producer but also as a source of supplementary income for them.

High population densities in the region make it essential that the production systems should ensure the optimum utilization of scarce land resources, whether it be for production of food or other crops.

In this context, the vast capacity of cattle and buffalo to convert crop residues and by-products into economically useful products has to be used to the best advantage of the small scale producer in particular.

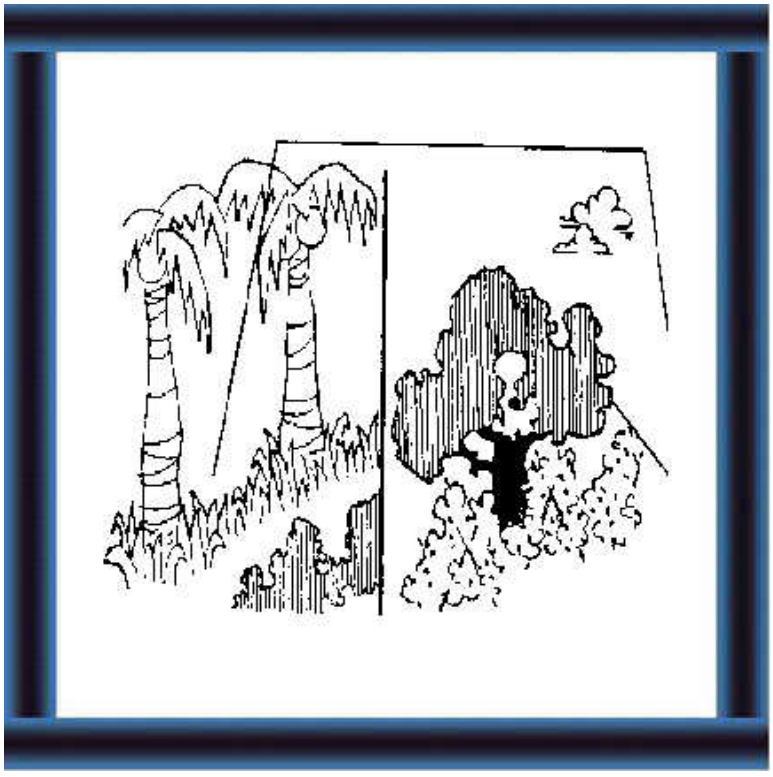
On the other hand, to obtain the best productivity from the land and the animals, fodders and legumes have to be incorporated into the system without adversely affecting the main crops.

Extension Materials

What should you know about dairying as part of integrated farming systems (IFS)?

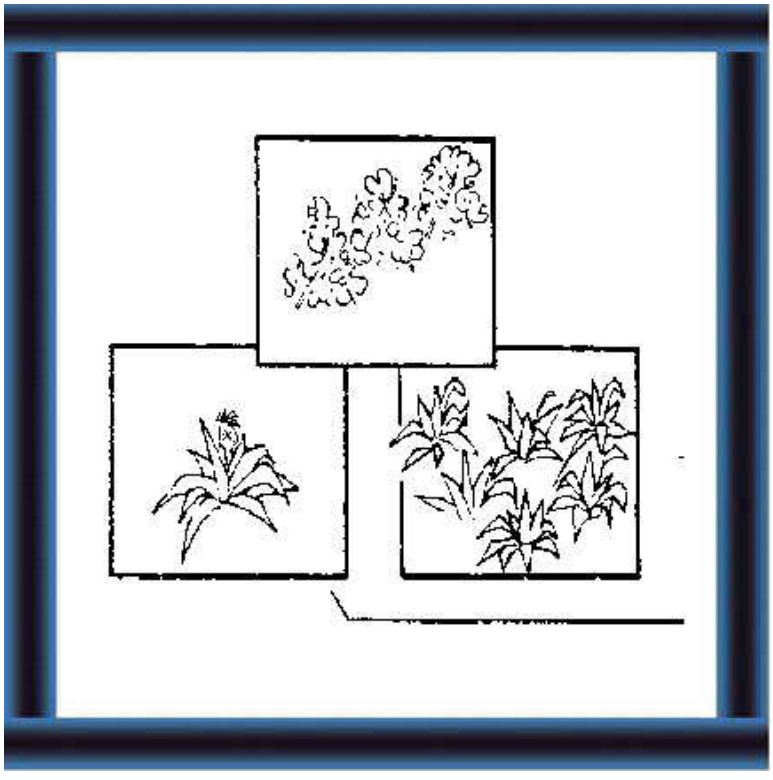
What is IFS and why is it important for you? (5-16)

1 IFS is planning and managing inputs and outputs for maximum benefit.



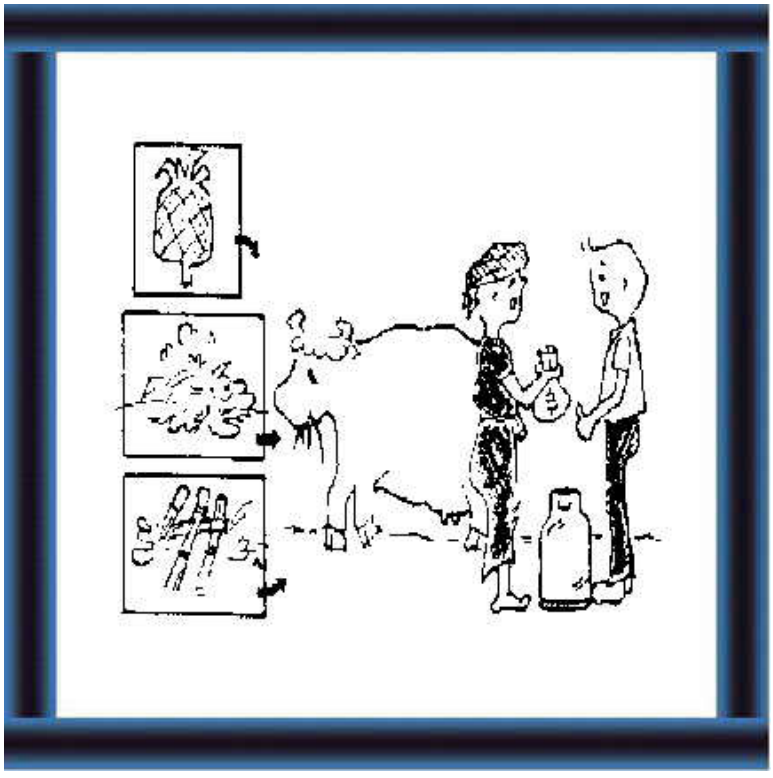
How can you grow fodders, legumes, grasses as part of IFS? (17-24)

2 You can plan to grow fodders, legumes, grasses:
- to grow with other crops
- to help other crops.



Which crop residues and by-products can you use for feeds? (25-32)

3 You can use many such as:
- ground nut cake
- pineapple waste
- molasses.

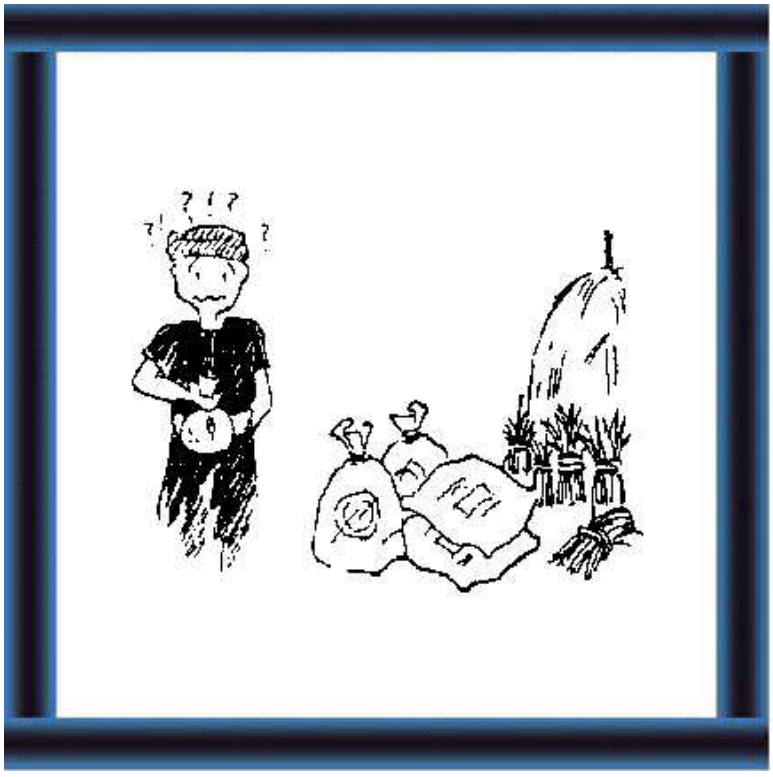


What are the "Six F's" of IFS and how do they fit together? (33-45)

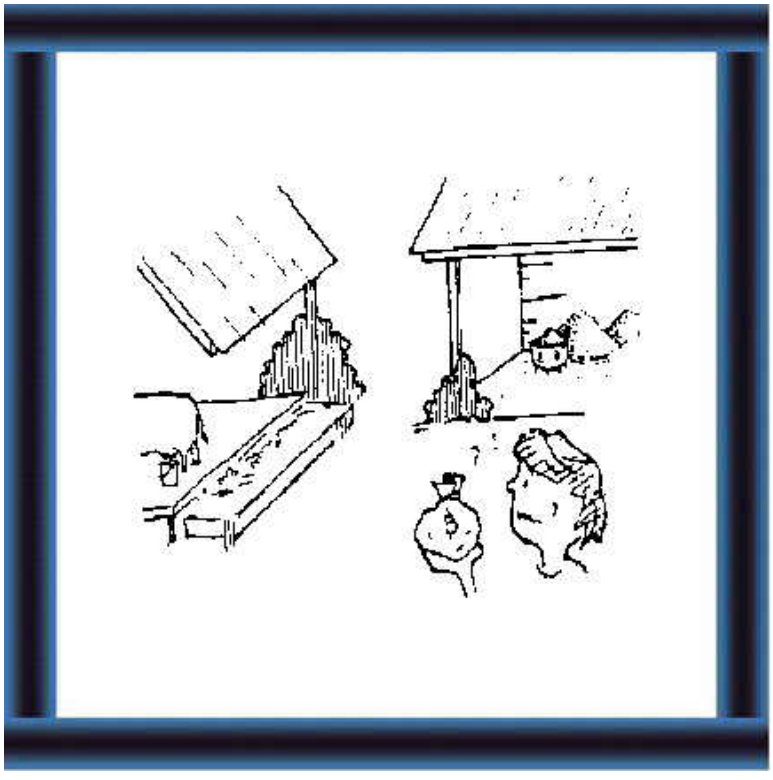
4 The "Six F's" are important things for you to plan and manage on your farm to bring you benefit.

What is IFS?

5 IFS is **planning** and **managing** your farm



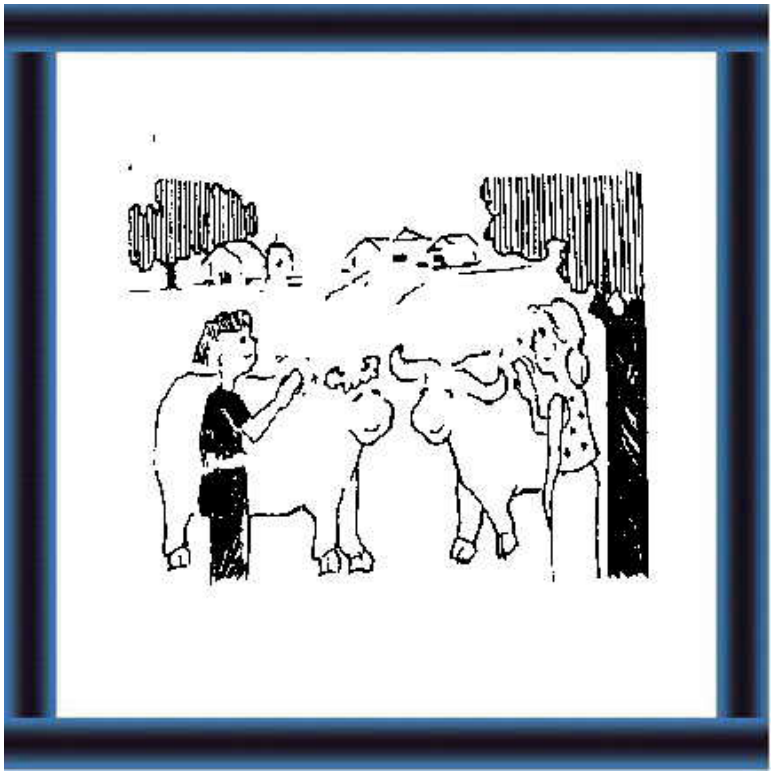
6 to make the **best use** of your inputs:
- funds
- fertilizers
- feeds
- labour etc;



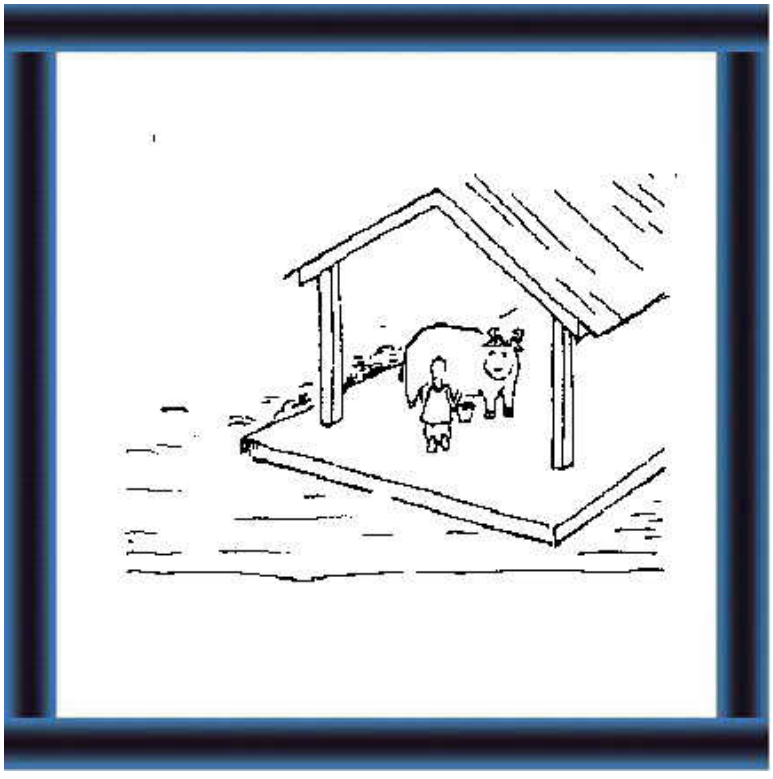
7 and to make the **best use** and/ or to get the **best price** for your outputs:
- crops
- manure
- milk
- meat etc.

8 You can **plan** for and **manage** your dairy cattle and buffalo together with your other farm operations
- IFS.

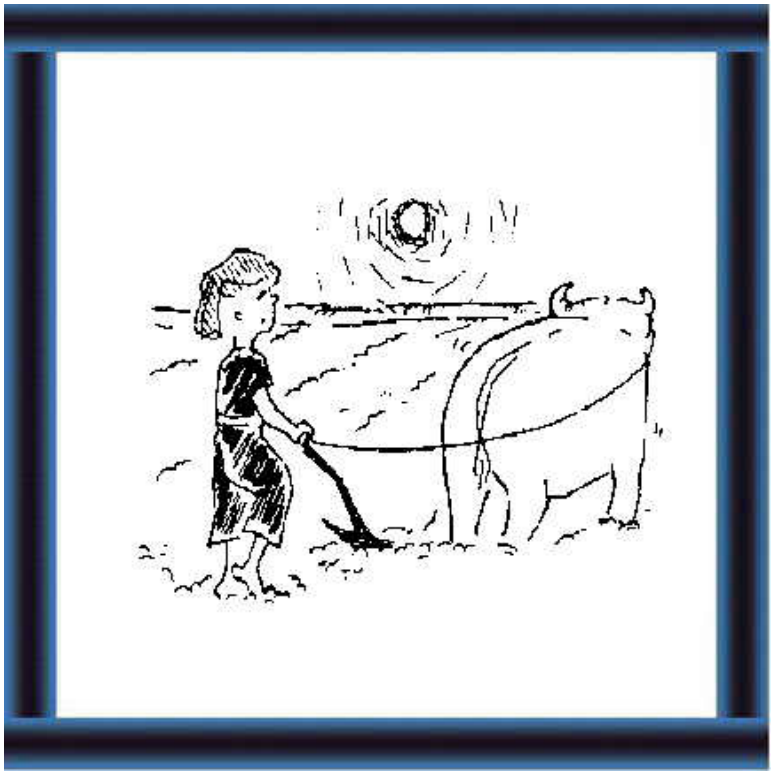
Why is IFS important for you?



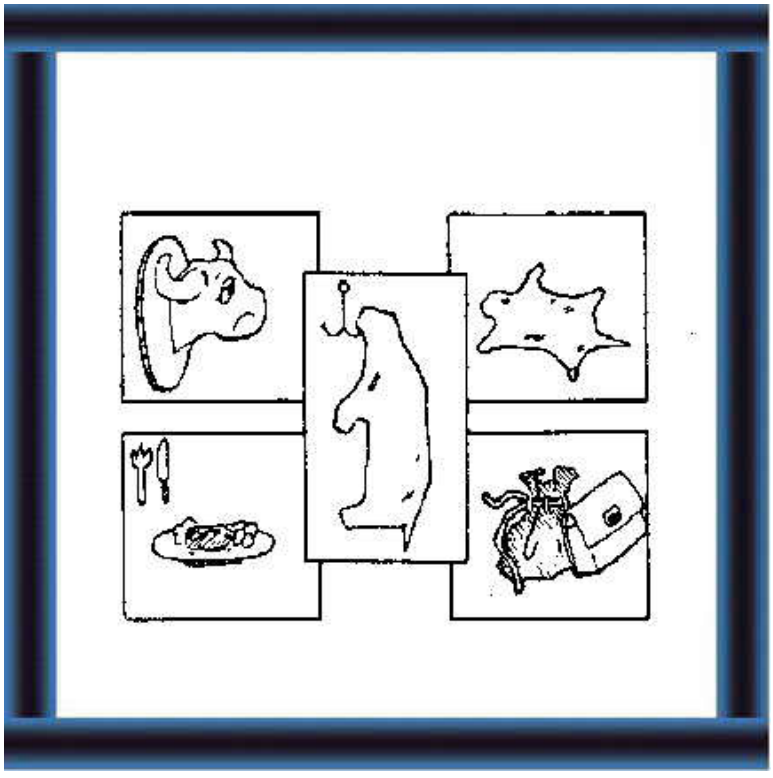
9 Cattle and buffalo are **important** in your farming system and IFS can make the **best** use of them.



10 They provide:
- **milk** and **manure**

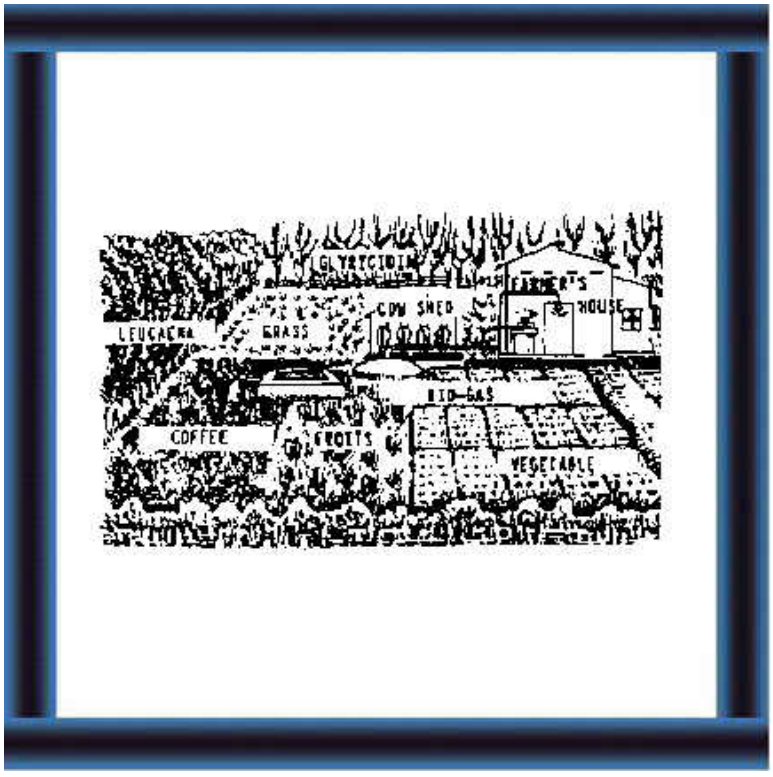


11
- **draught power**

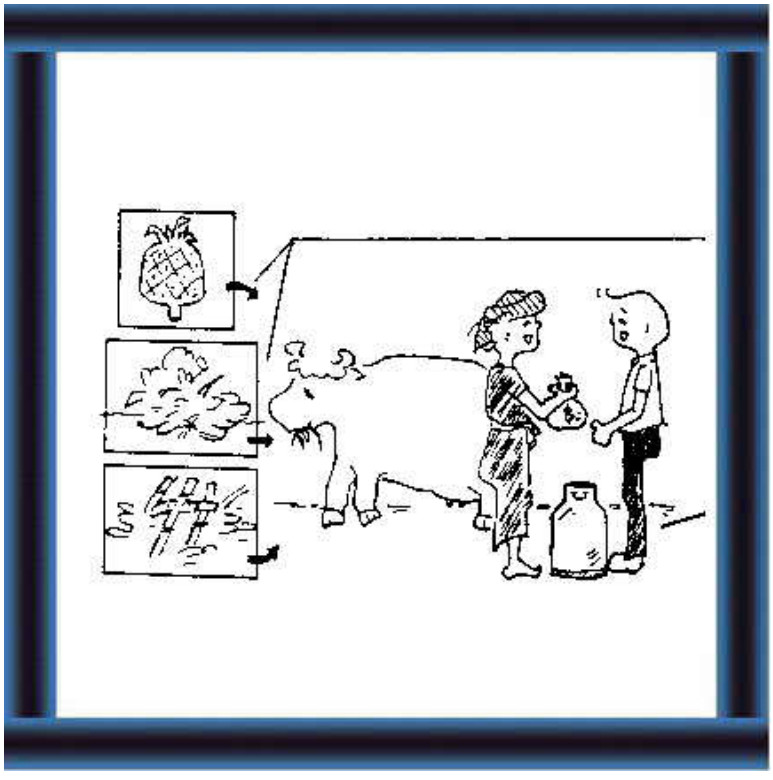


12
- **meat** and **hides**.

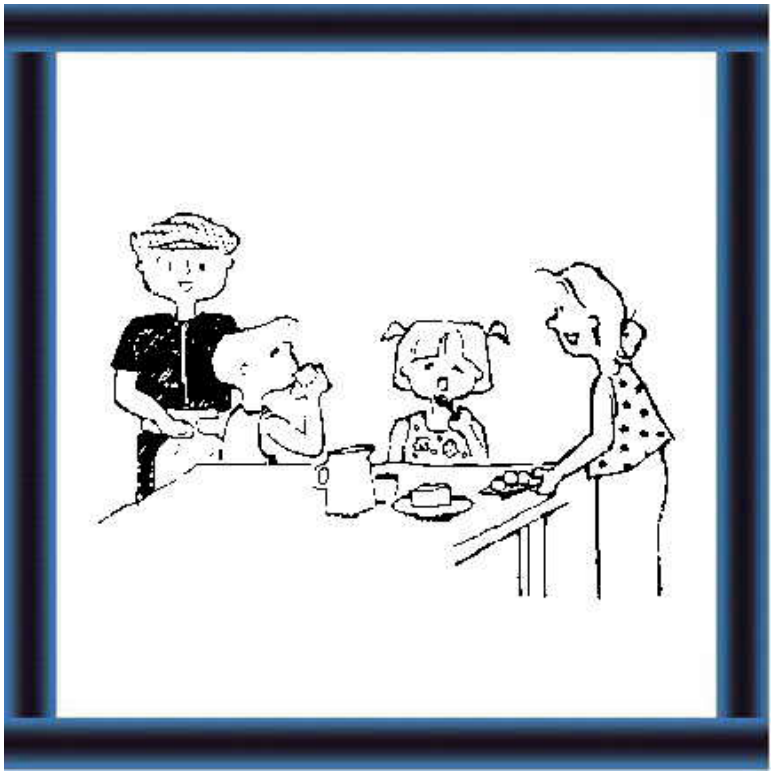
13 With IFS you use your land, cattle and buffalo to make **more money**



14 by growing **fodders** and **legumes** with your main crops



15 and by changing crop residues and by-products into things you can **sell**



16 and use to feed your family.

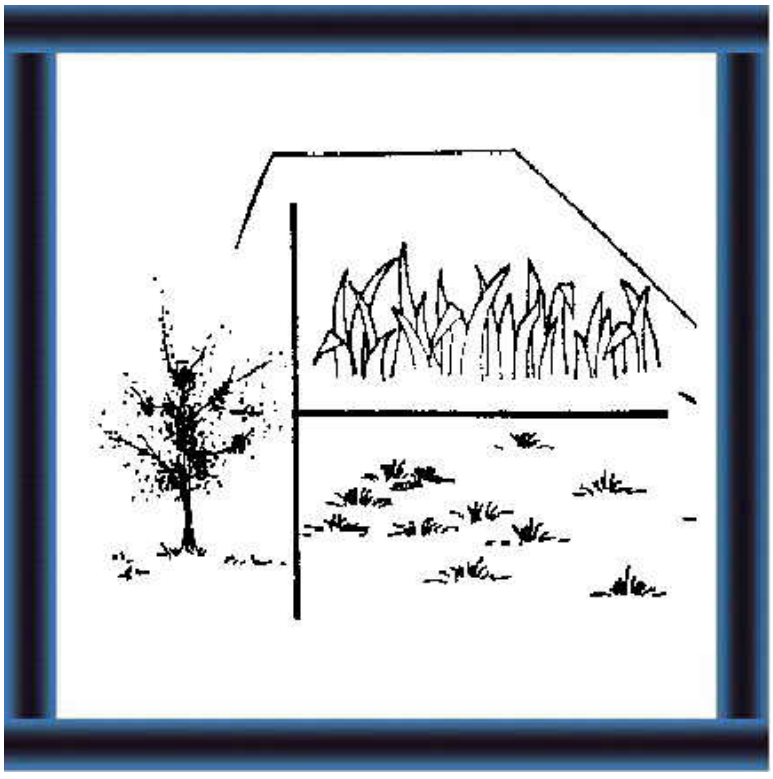
Incorporation of fodder/legumes into farming systems

Fodders, legumes and grasses can be incorporated in crop farming systems either individually or in combinations. Some methods are to grow them:

- in marginal areas where no other crop can be grown (19)

- along with or under other crops without adverse effects on main crops, e.g. grasses/legumes under coconut, legumes (such as Stylosanthes varieties) on paddy field bunds, legumes along with rice stubble.

How can you grow fodders, legumes, grasses as part of IFS?

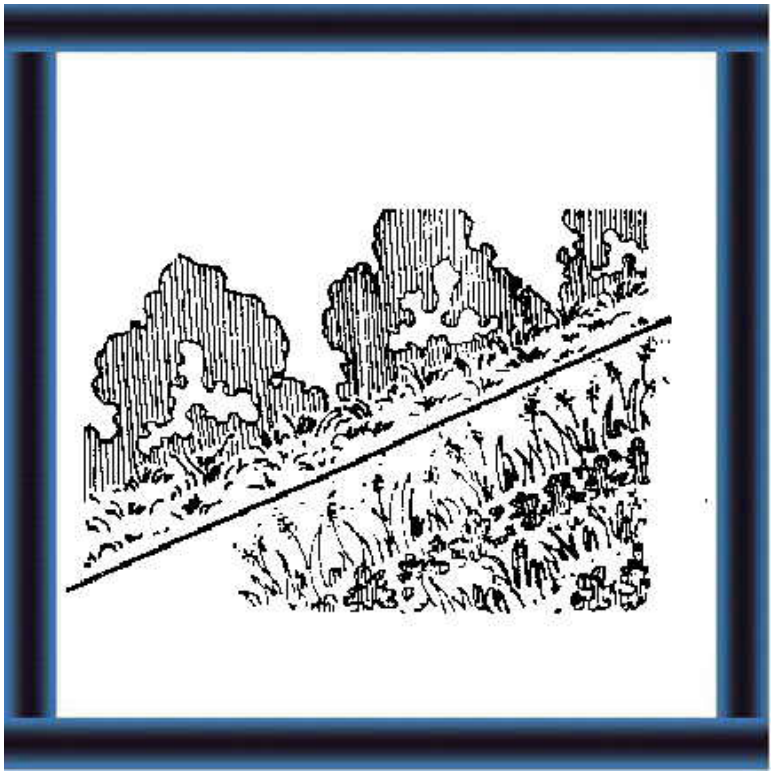


17 You can grow
- a fodder
- a legume
- a grass

by itself in your farming system

18 or you can grow all three in combinations.

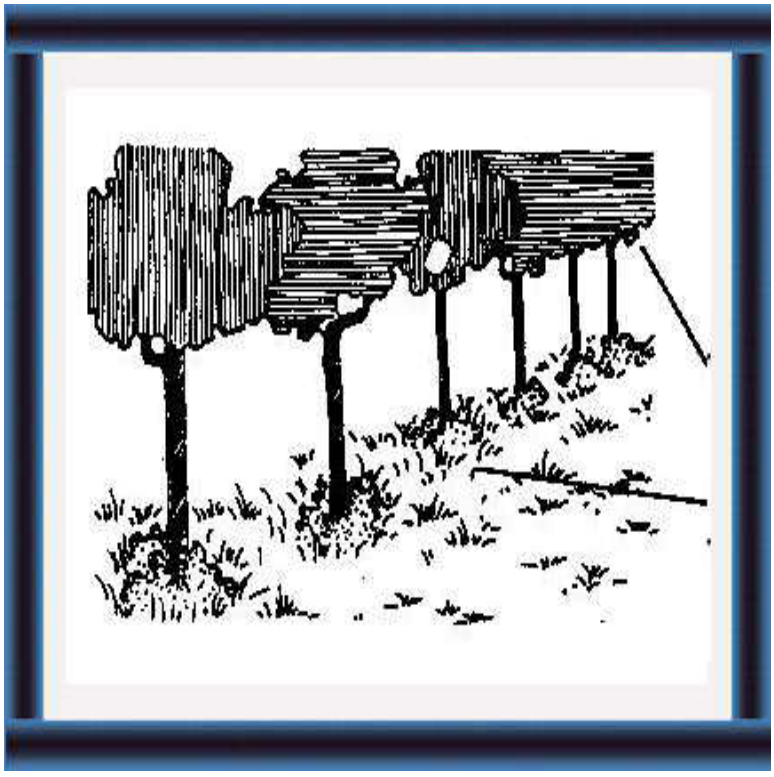
19 You can grow fodders, legumes, grasses:
- in areas where you **cannot** grow other crops, e.g. less productive land



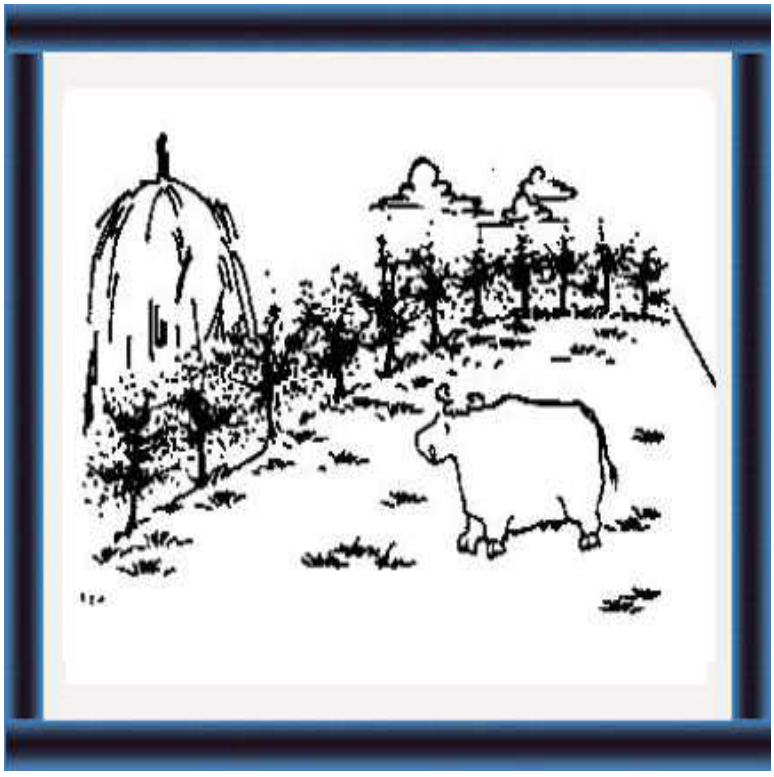
20
- **with other crops** e.g.
- legumes (such as Stylosanthes) on paddy field bunds
- legumes along with rice stubble.

- along boundary fences, e.g. Leucaena and Glyricidia can serve as live fence giving protection to crops in addition to providing roughage.

21
- **underother crops** e.g.
- grasses/legumes under coconut



22
- grasses/legumes under Tanol rubber trees



23
- **along boundary fences** e.g.
- Leucaena or Glyricidia as a live fence.

24 Fodders, legumes, grasses:
- **protect crops from animals**
- **provide roughage**.

Crop residues and by-products

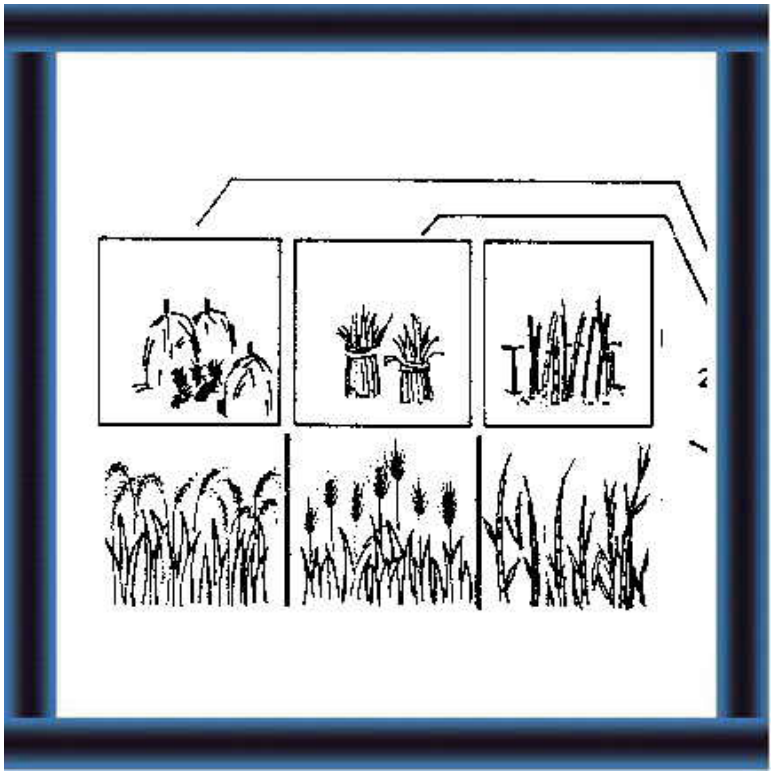
There is a very large number of crop residues and by-products that can be fed to cattle and buffalo corresponding to the varieties of crops grown in the region. Some important ones among them are:

Crop residues:

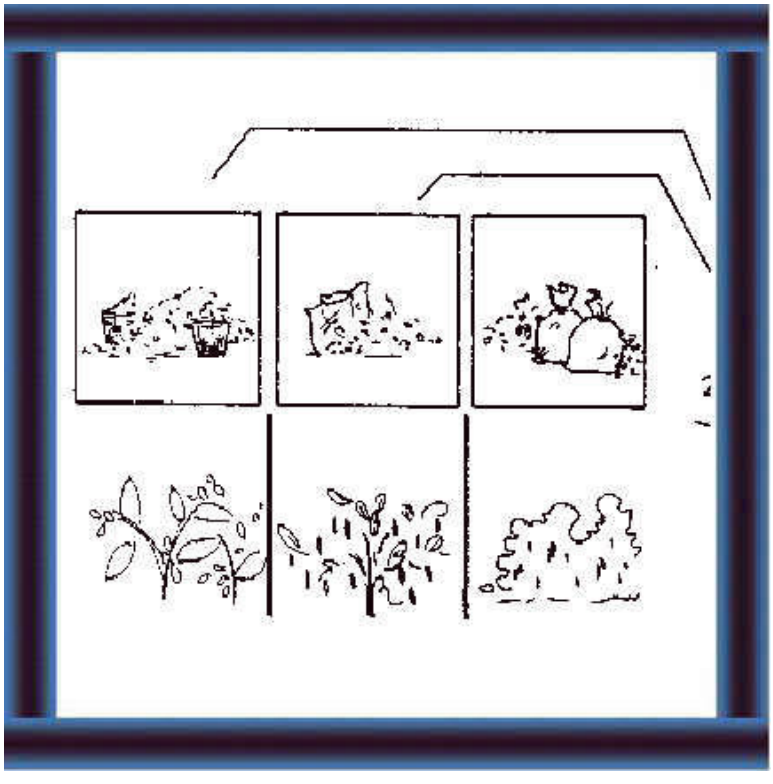
- rice straw
- wheat straw
- sugarcane tops
- cocoa pods
- peanut residue
- baby corn
- soybean hulls
- corn cobs

Which crop residues and by-products can you use for feeds?

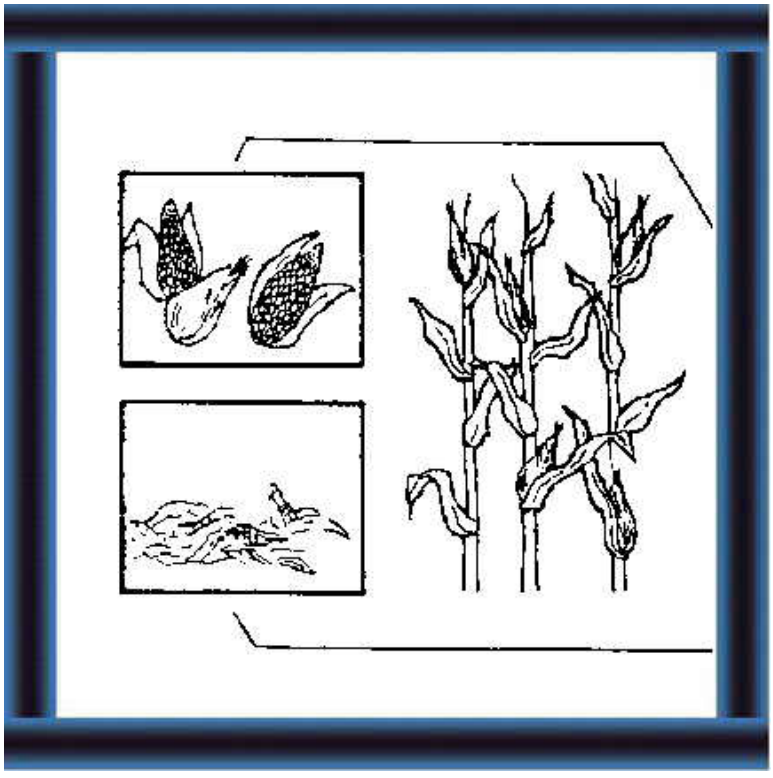
25 You can feed many different crop residues and by-products to your cattle and buffalo.



26 **Crop residues**:
- rice straw
- wheat straw
- sugarcane tops



27
- cocoa pods
- soybean hulls
- groundnut (peanut) residue

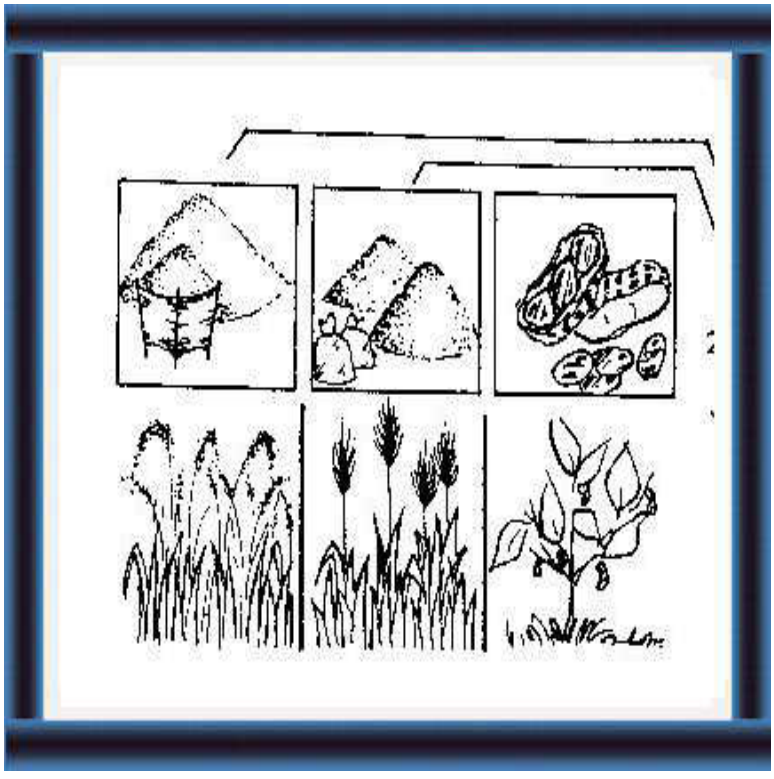


28
- corn residue
- corn cobs

Agricultural by-products:

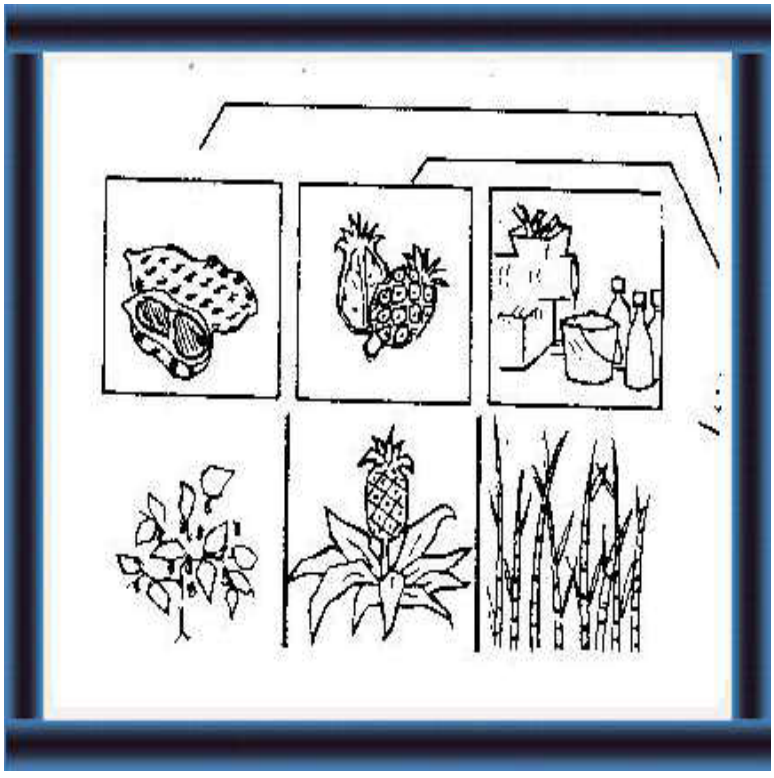
- rice bran
- wheat bran
- coconut cake
- soybean meal
- palm kernel cake
- sunflower cake
- groundnut (peanut) cake
- pineapple waste
- molasses

There are many residues and by-products which can be (and are being) used for cattle/buffalo feeding in localities where they are available.



29 **Agricultural by-products**:
- rice bran
- wheat bran
- soybean meal

30
- coconut cake
- palm kernel cake
- sunflower cake



31
- groundnut cake
- pineapple waste
- molasses.

32 There may be other useful residues and by-products in your area. Ask other farmers and your extension worker.

Six "F"s of Integrated Farming

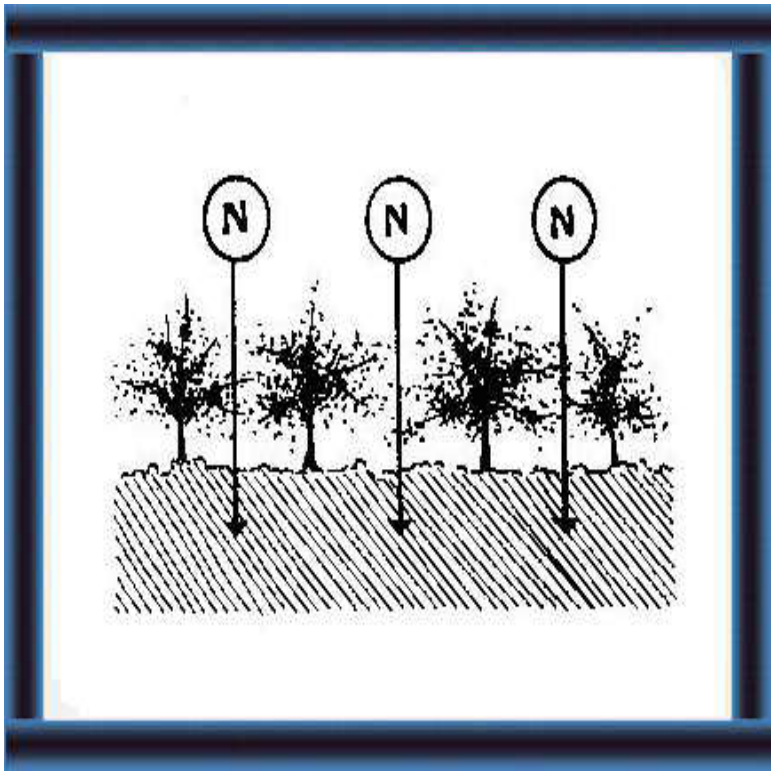
Feed: Increased roughage availability to cattle and buffalo from the above combinations is clear. (33)

Fertilizer: The legume components will add to the soil fertility directly through nitrogen fixation. By converting the extra roughage into dung, cattle and buffalo make a large contribution in the production of organic fertilizer and improved soil fertility (34-35)

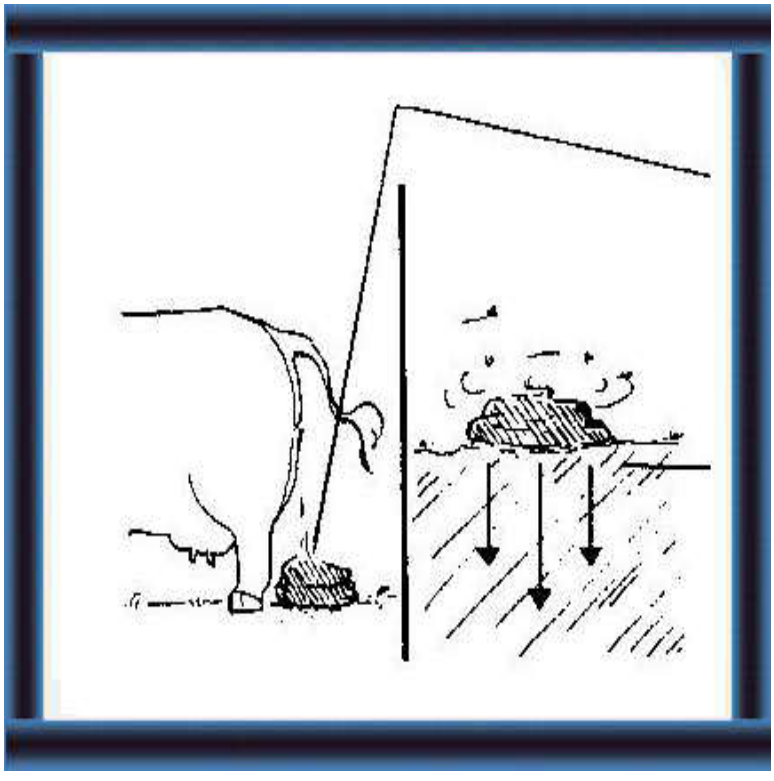
Fence: The tree fodders and legumes such as Glyricidia and Leucaena can be grown in such a way as to provide live fence or hedge along the boundaries. (36)

What are the "Six F's" of IFS?

Feed
33 You get **more roughage** for your cattle and buffalo.



Fertilizer
34 The legumes make your soil **more fertile** by adding nitrogen.

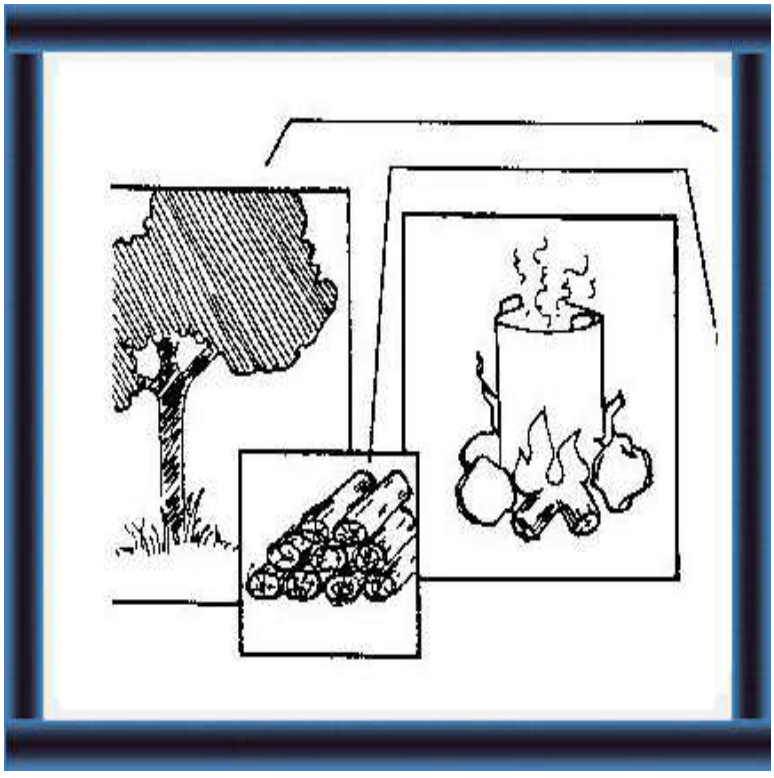


35 Your animals change the roughage to **manure** which makes your soils **more fertile**. (See H. 1.2 Compost Manure)

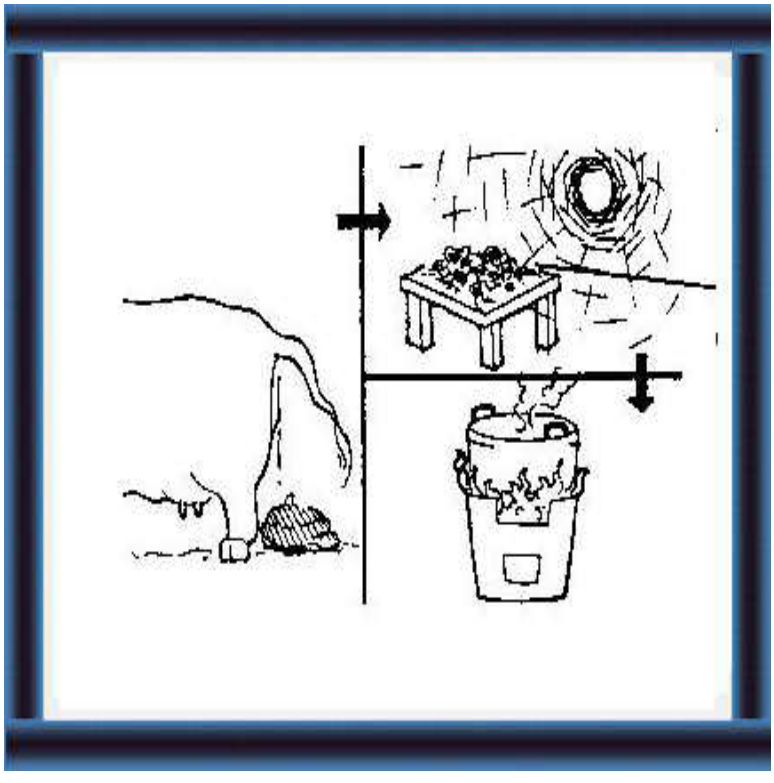
Fence
36 You can grow tree fodders and legumes (e.g. Glyricidia and Leucaena) as a **live fence**.

Fuel: Mature branches from fodder/legume trees can be used as fuel. In some areas dried dung is also used as fuel. A more efficient way, however, is to pass the dung through a bio-gas plant which yields bio-gas as a fuel and leaves the slurry for making compost. (37-40)

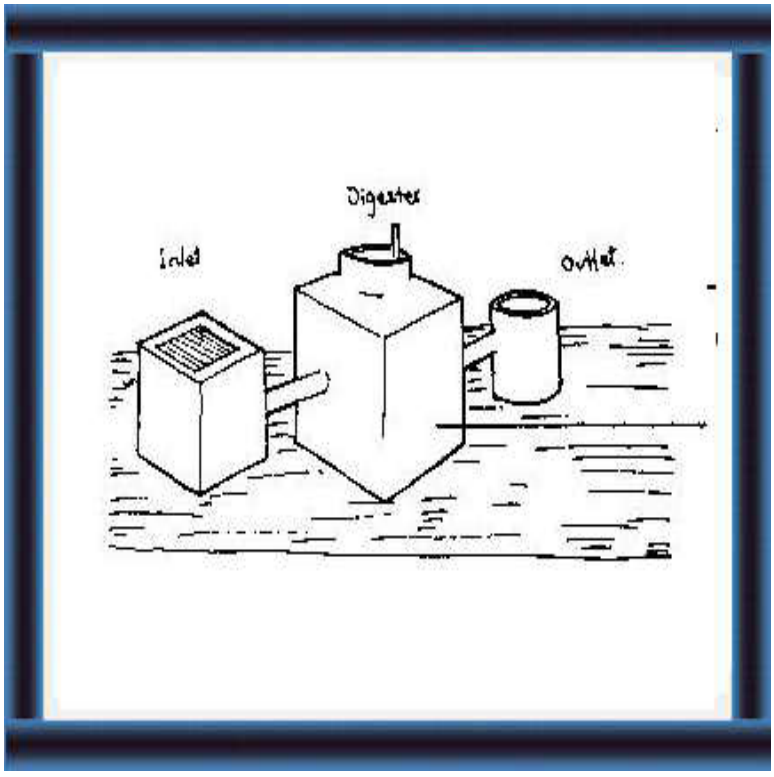
Fuel



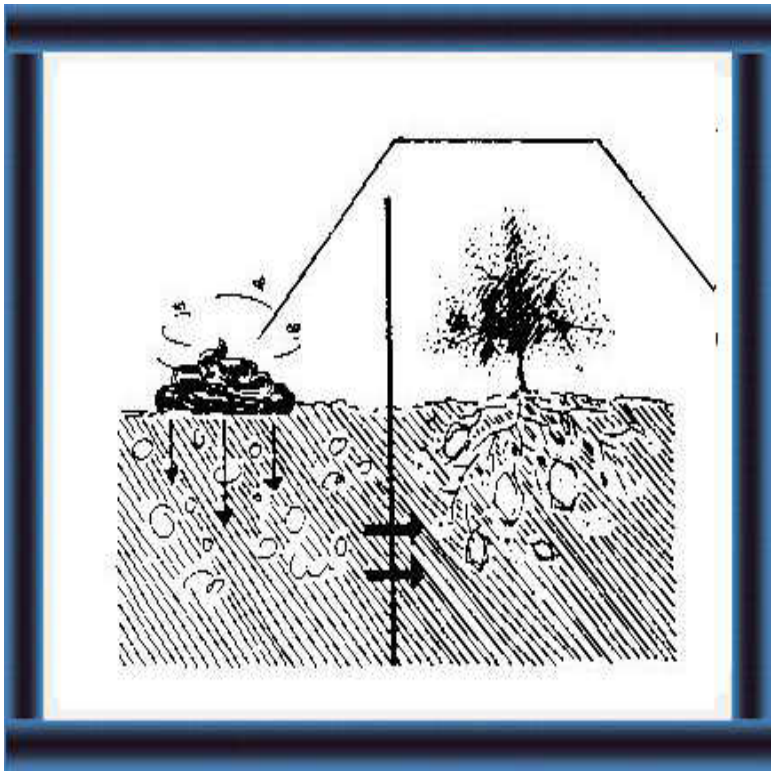
37 You can use:
- **mature branches** from fodders, legume trees



38
- **dried manure**



39
- **bio-gas** from manure in a bio-gas plant.

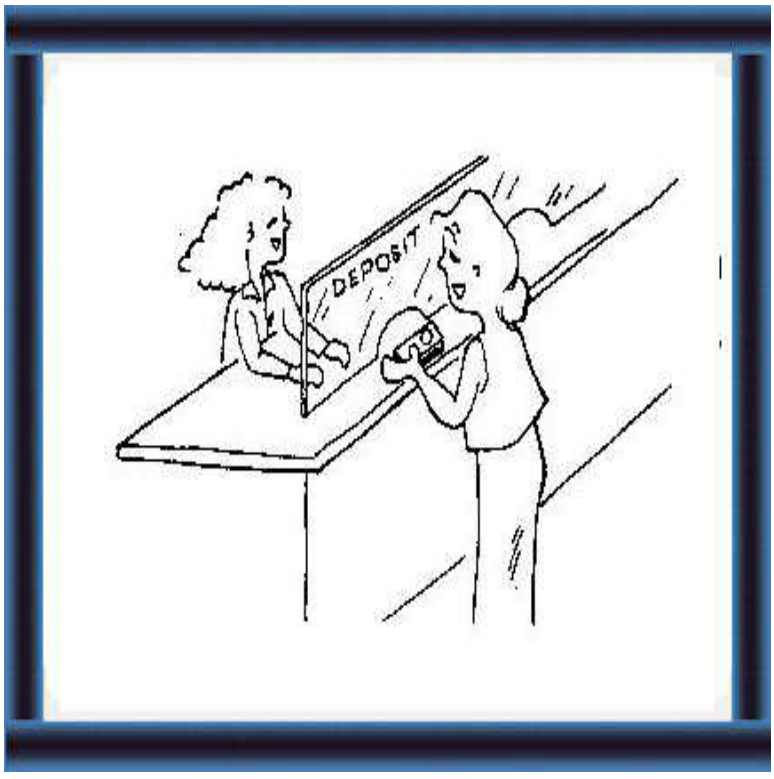


40 This is good because you can use the slurry from the bio-gas plant for making **compost**.

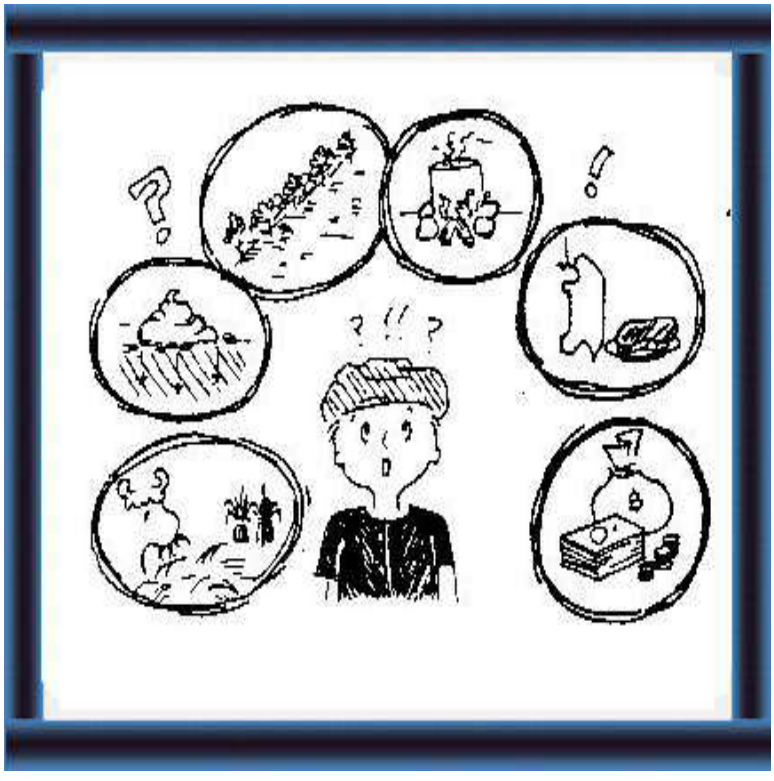
Food: Food for the human population by increasing the production of crops, milk and meat. (41)

Funds: Higher income for farmers from increased crop production and the sale of surplus milk and animals. (42)

Food
41 You get **more crops**, **milk** and **meat** for your family.

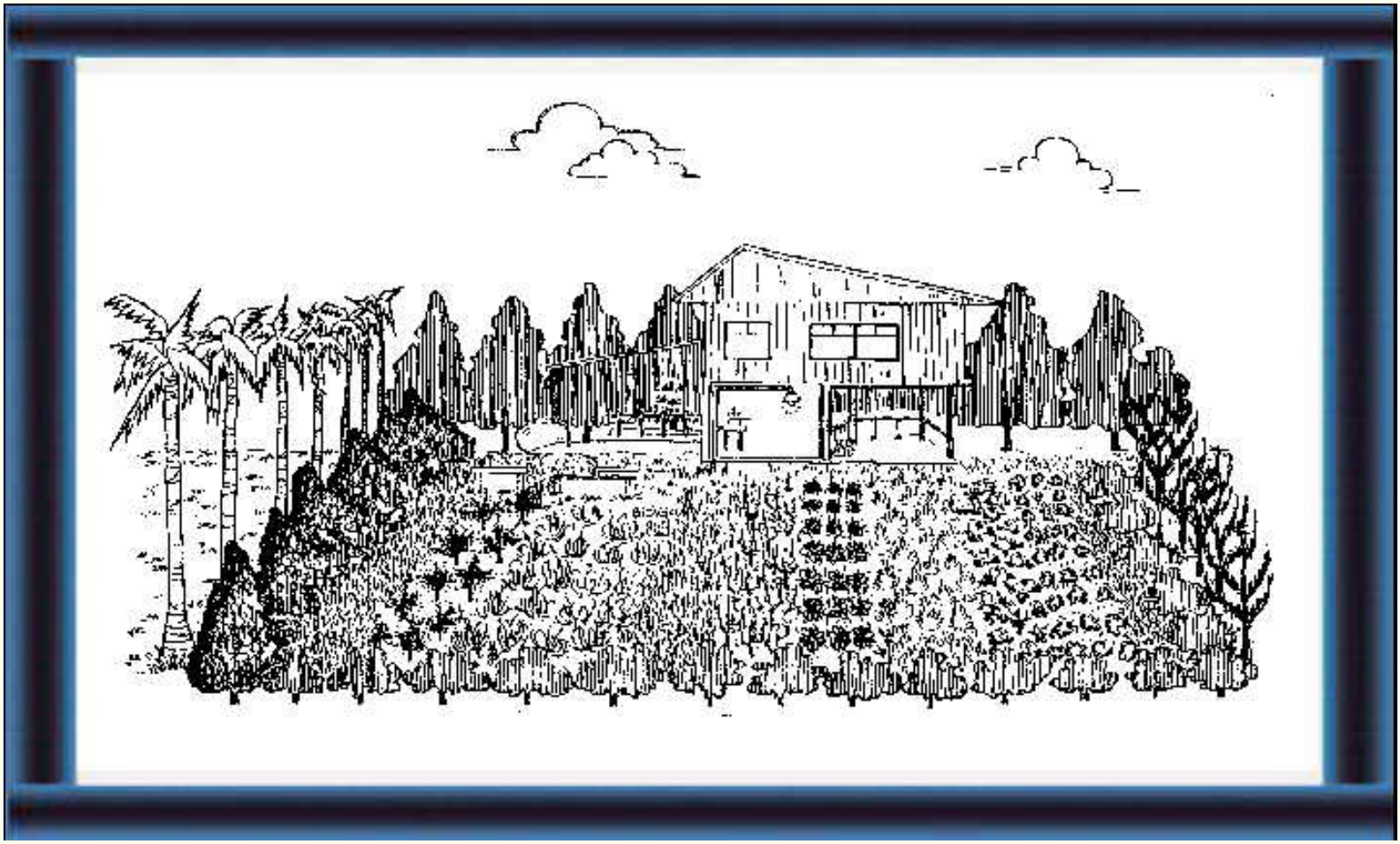


Funds
42 You get **more money** from the sale of surplus crops, milk and meat.



43 **How do the "Six F's" fit together?**

44 **Well prepared land for IFS**



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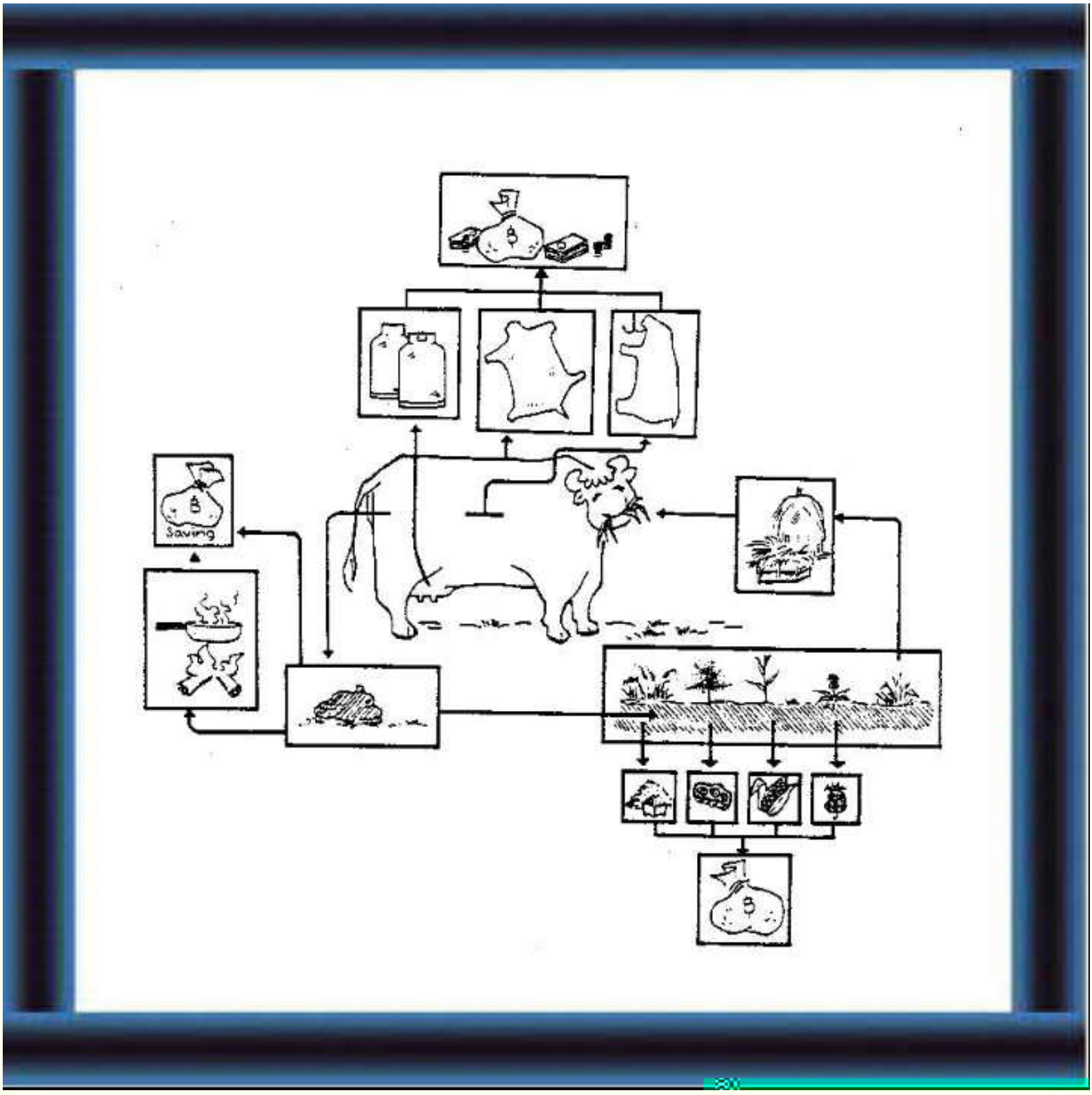
45 **Dairy animals in IFS**


Saving

What do you know about dairying as part of IFS?

What IFS is

Importance of IFS

Growing fodders/legumes/grasses as part of IFS

Crop residues and by-products for feeds

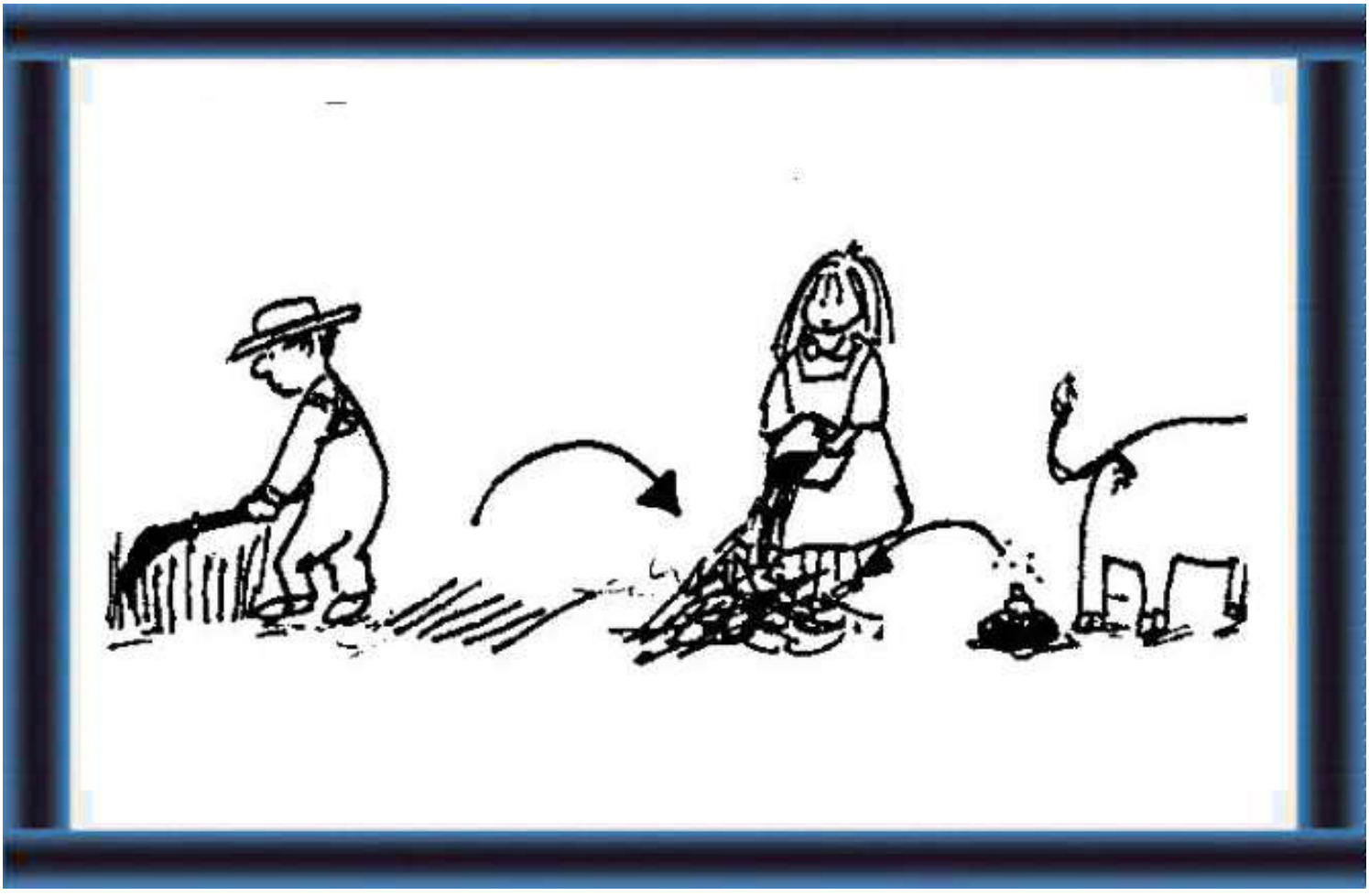
Small-Scale

Dairy Farming Manual

Volume 2

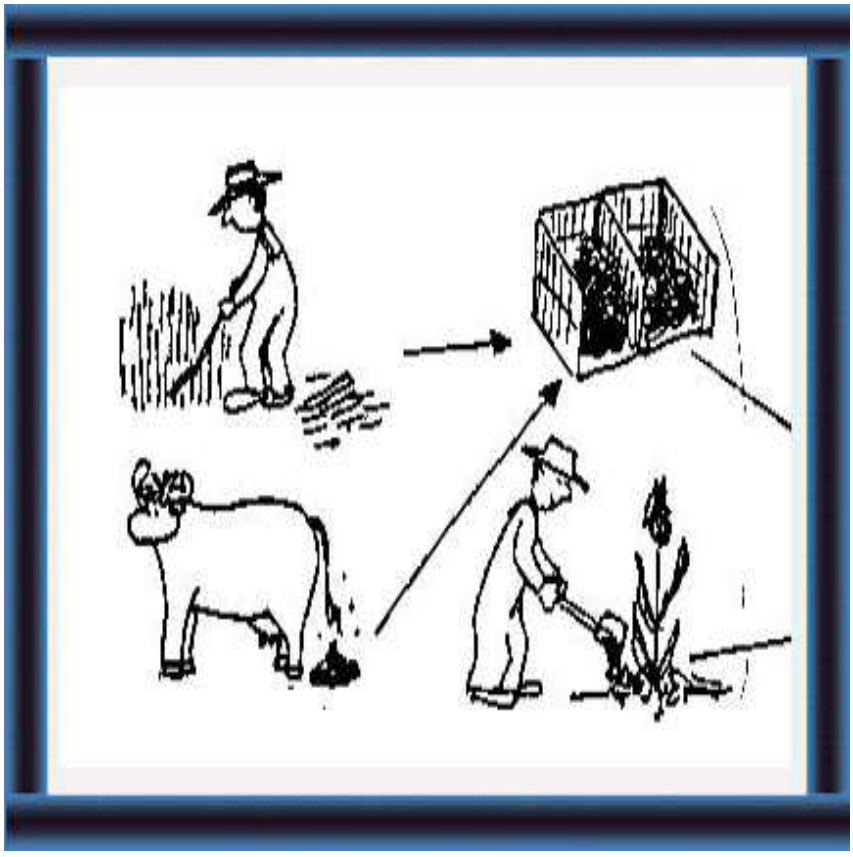
Husbandry Unit 1.2

Compost Manure



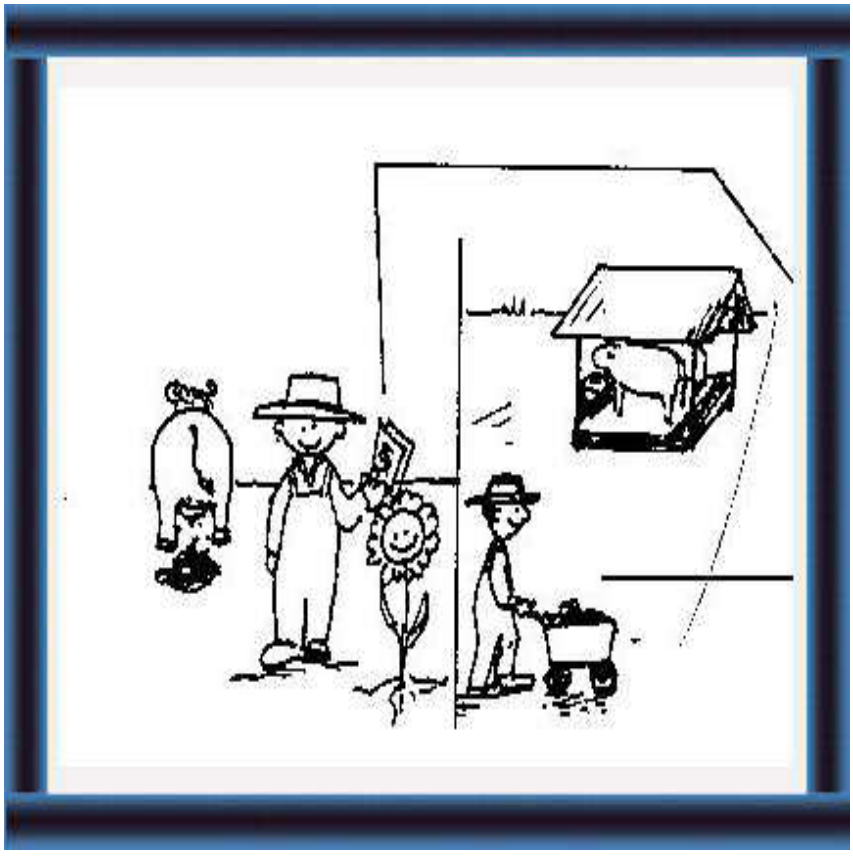
Extension Materials

What should you know about compost manure?



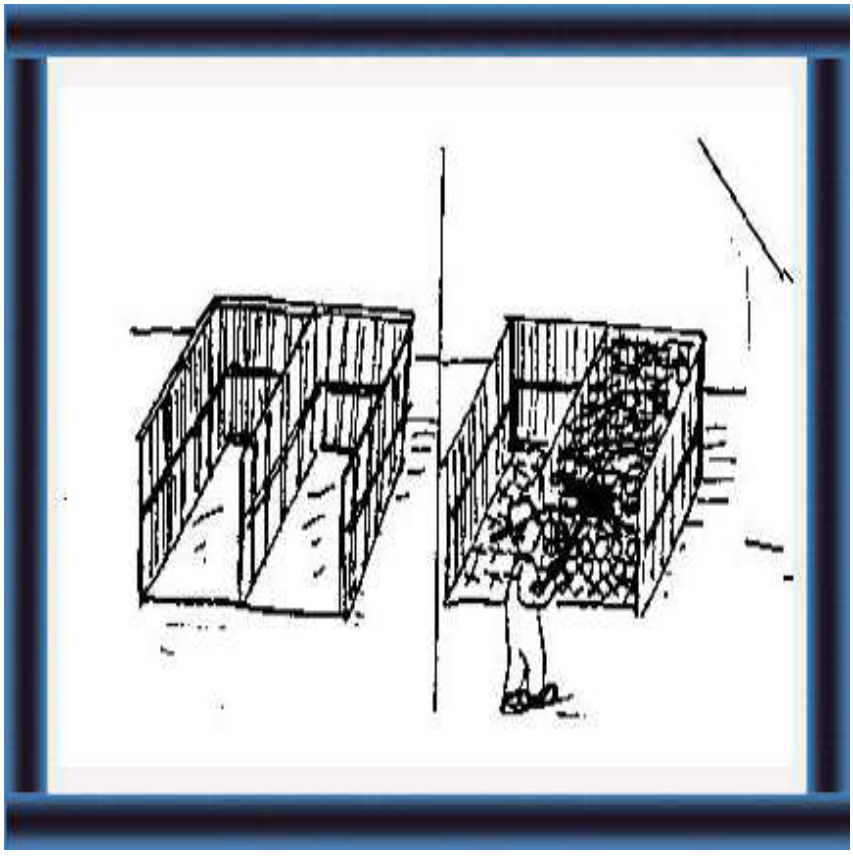
What is compost manure? (5-8)

1 You should know:
- what makes compost manure
- its value as a manure for plants.



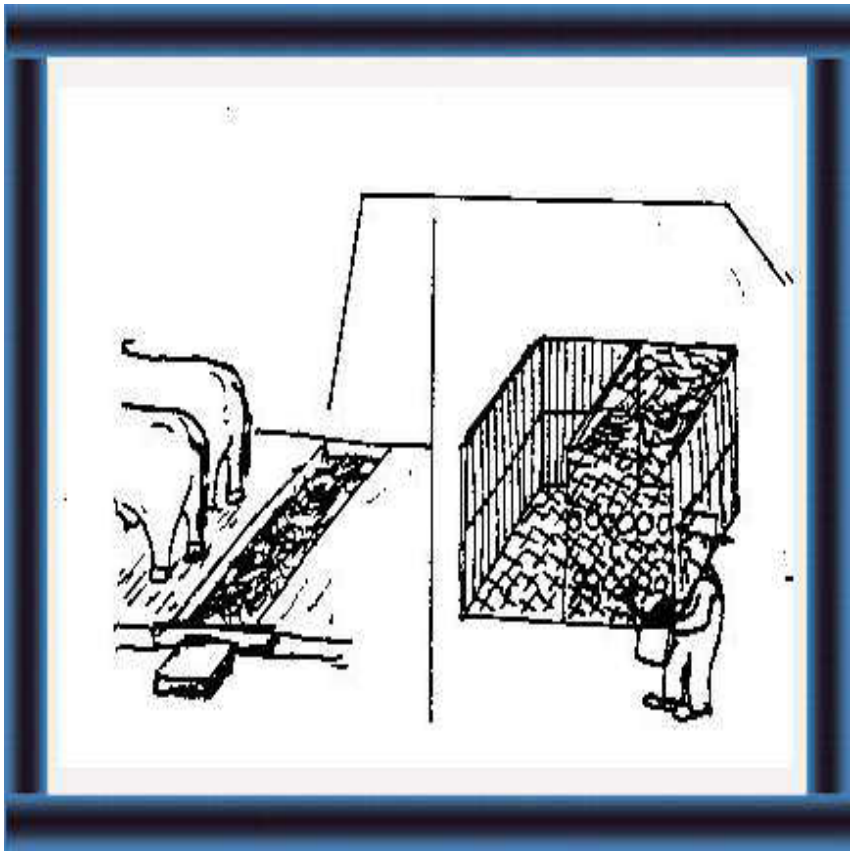
Why use compost manure? (9-22)

2 Reasons for using compost manure are:
- it provides nutrients but is cheaper than fertilizer
- it is easy to handle and improves health and hygiene on your farm.



How can you make compost manure?(23-30)

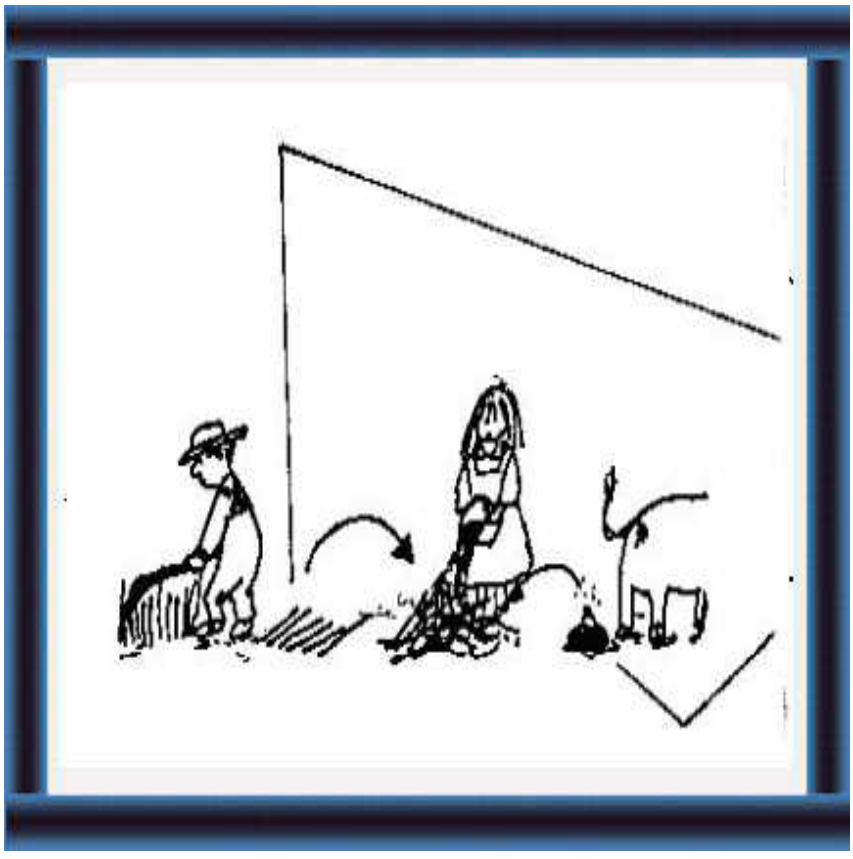
3 You should know how to:
- make a frame
- fill it with manure and straw



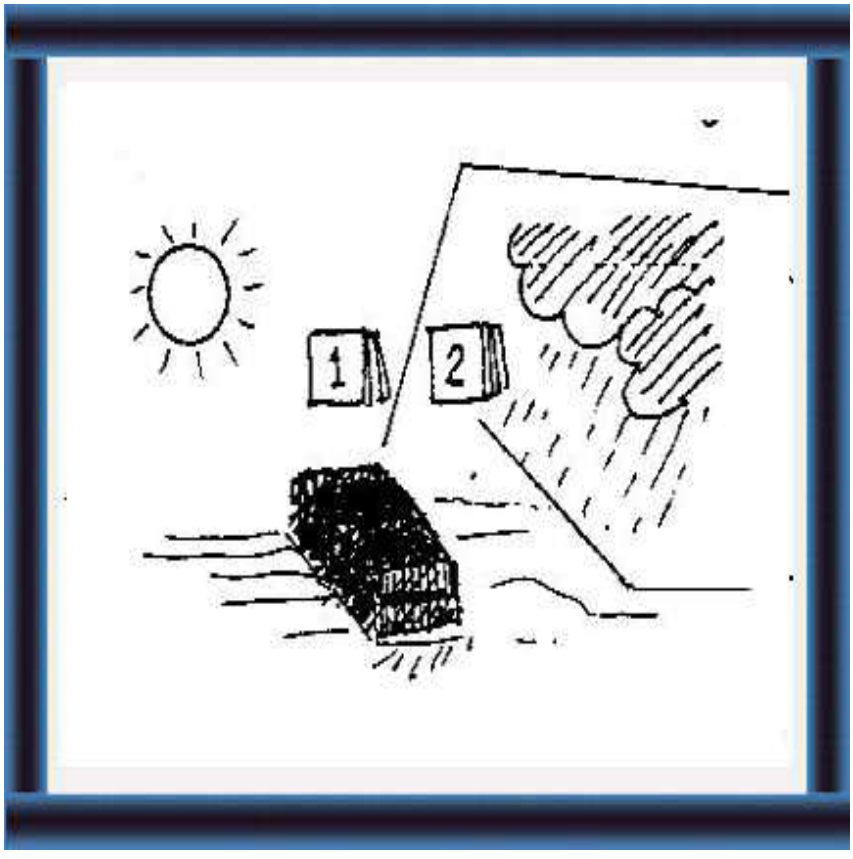
Important points about compost manure(31-36)

4 You should know:
- how to save urine and manure
- the best mixture for your heap
- when your compost manure is ready for use.

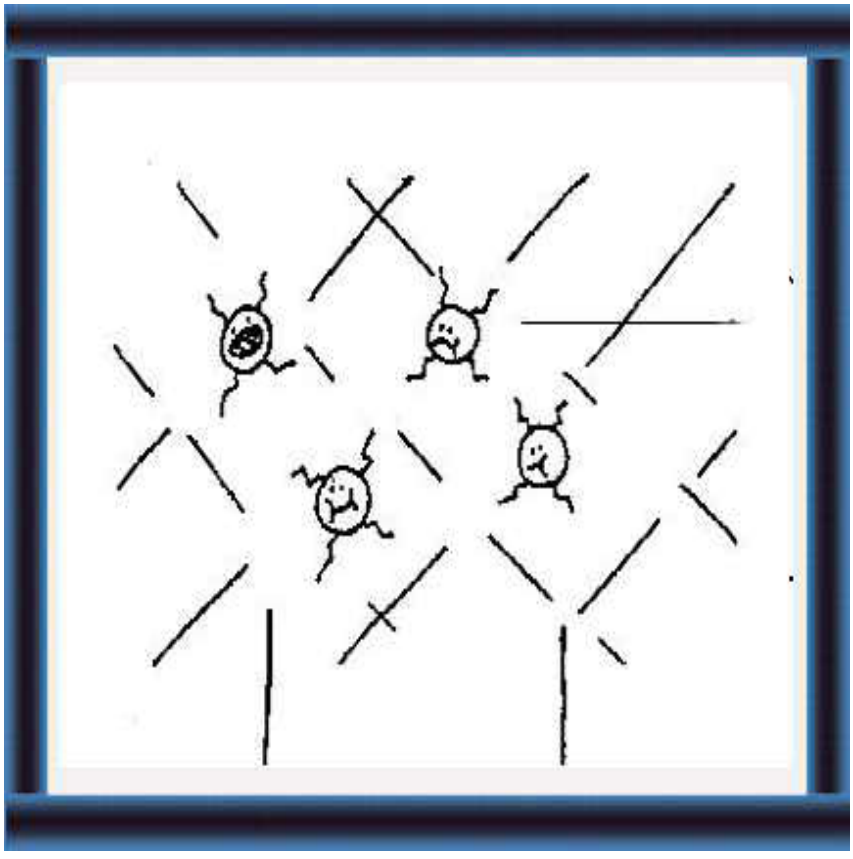
What is compost manure?



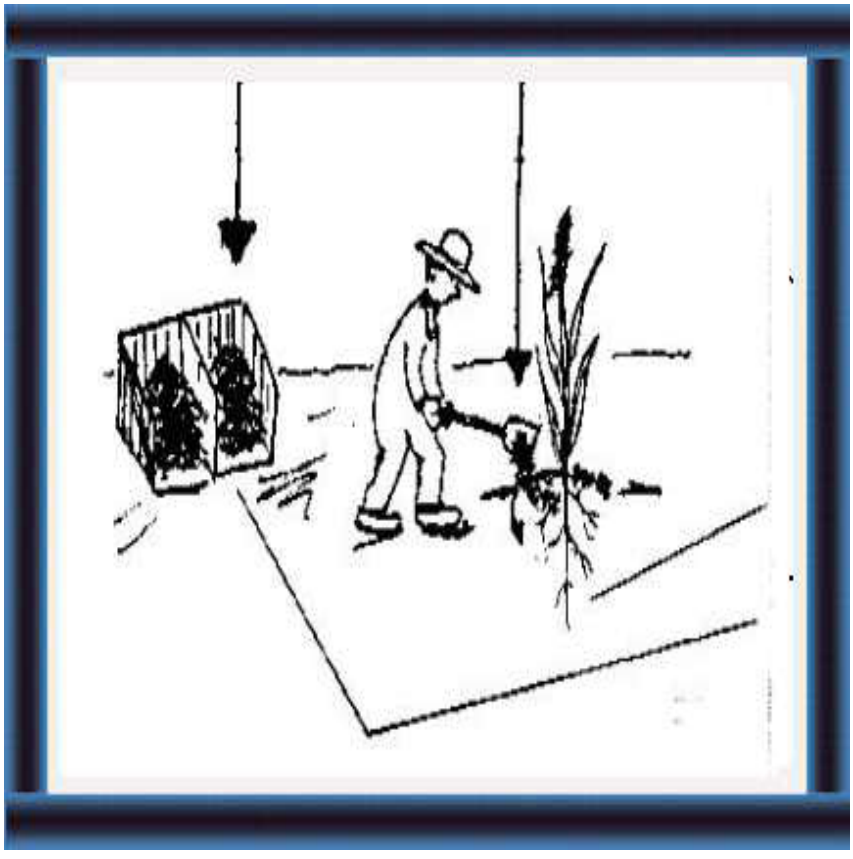
5 Compost manure is:
- **plant matter** such as straws and forages which you do not use (residues) mixed with **animal manure**
- you can also add **kitchen waste**



6
- covered with **straw** to protect against the rain
- left for a **few** months

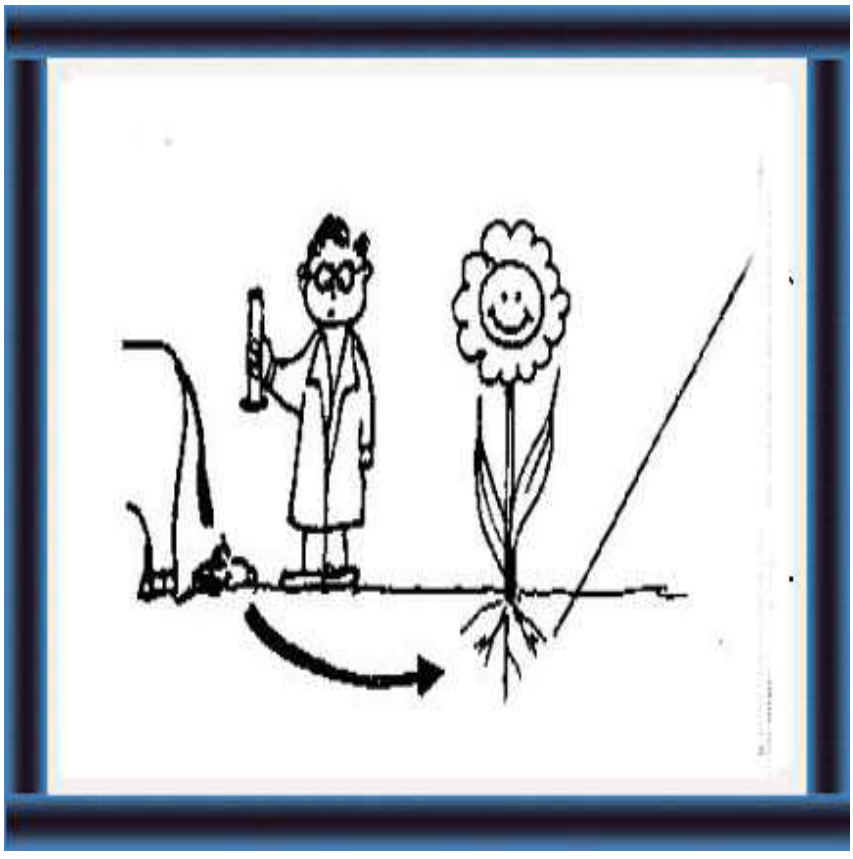


7
- **micro-organisms** break down the plant matter and manure and it becomes like humus



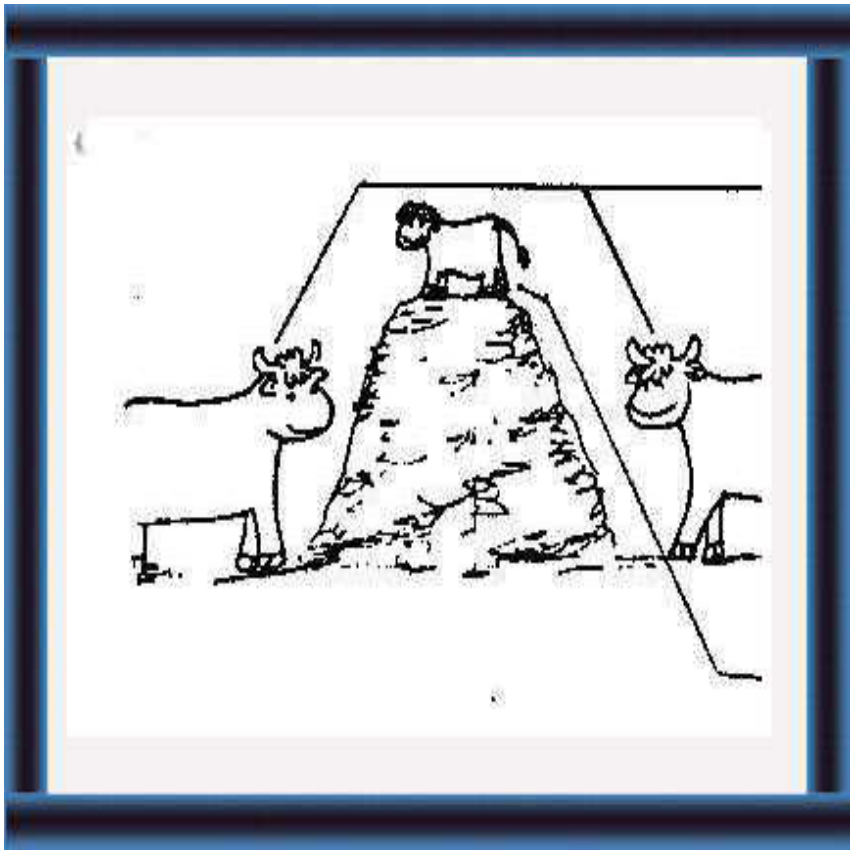
8
- and the **compost manure** gives **nutrients** easily to plants.

Why use compost manure?



9 **Nutrients**: it provides nutrients. 10 kg of manure contain:
- **nitrogen** N : 50 g
- **phosphorus** P : 25 g
- **potassium** K : 50 g

It also provides **magnesium** (Mg), **calcium** (Ca), **sulphur** (S) and **copper** (Cu) and returns **organic matter** to the earth.



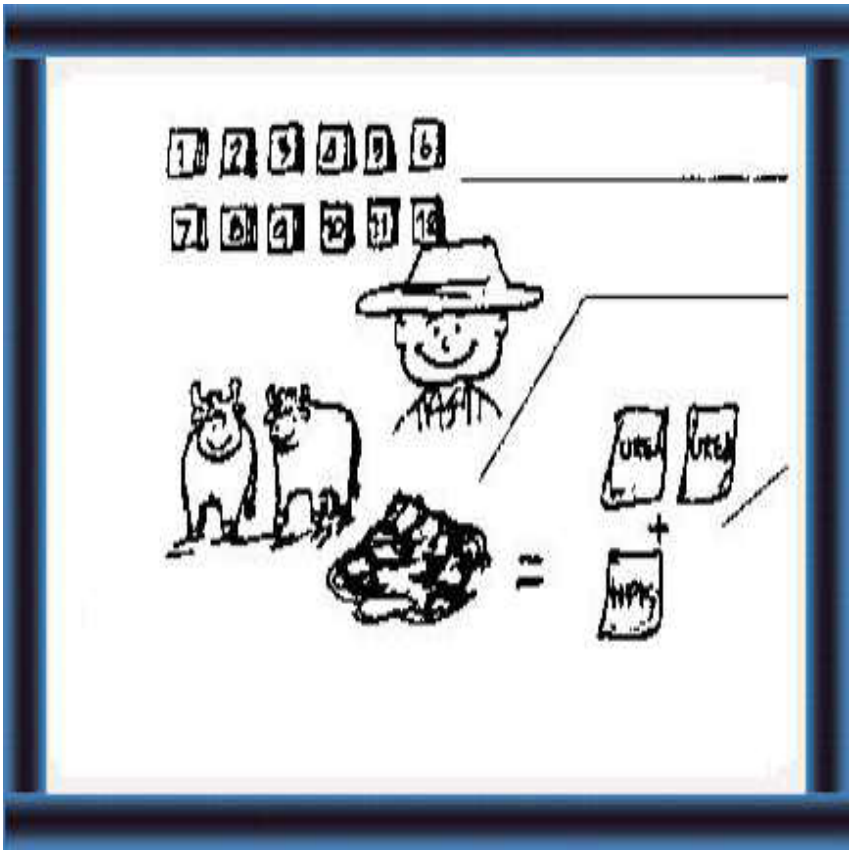
10 If you have **2 cows**, you get
- **50 kg** of manure **each day** (25 kg each cow)
- **1,500 kg** of manure **each month**
- **18,000 kg** of manure **each year**

You also get manure from your **calves**.

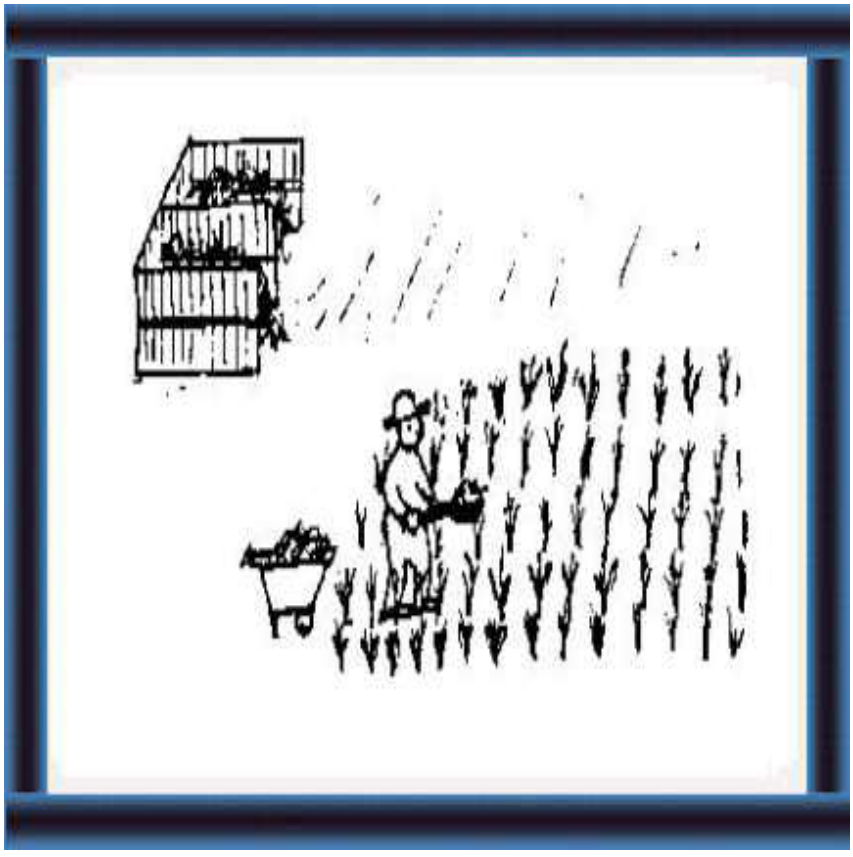
11 This manure contains:
N P K
1 month 7.5 3.8 7.5 kg
1 year 90.0 45.0 90.0 kg

12
- and after mixing and storing with plant matter, **more nutrients** are available from the broken down plant matter as well.

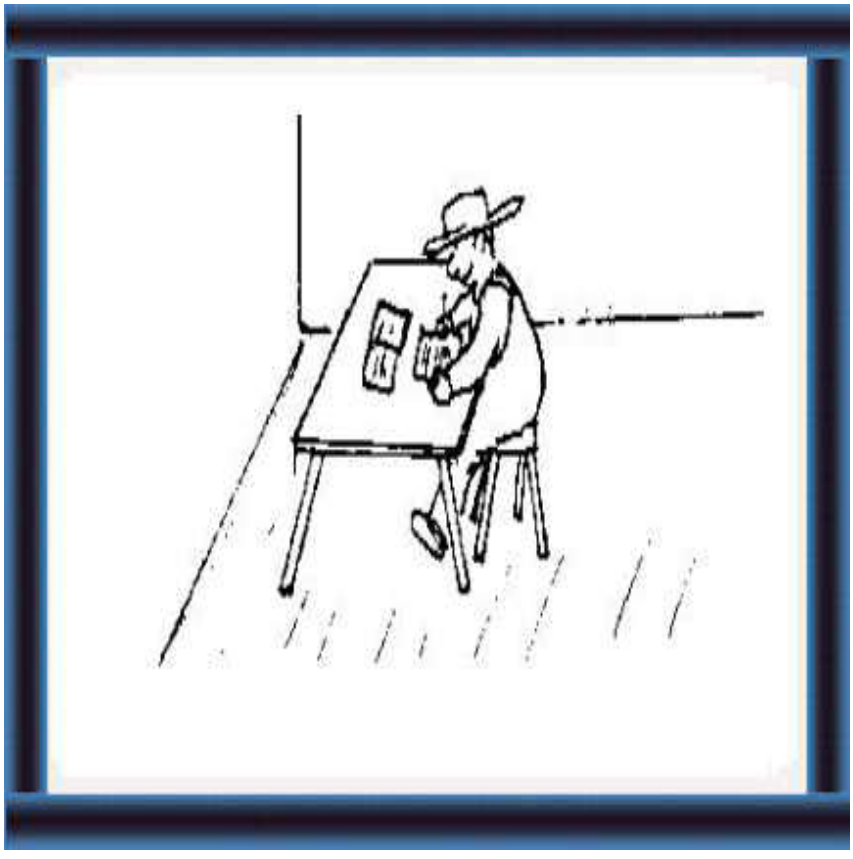
13 **Economy**: it saves you money. Fertilizers are expensive.
For example:
100 kg of urea cost 500 mu
100 kg of triple superphosphate cost 800 mu



14 In one year, your 18 tons of compost manure from 2 cows has the same nutrients as 200 kg of urea and 100 kg of triple superphosphate.



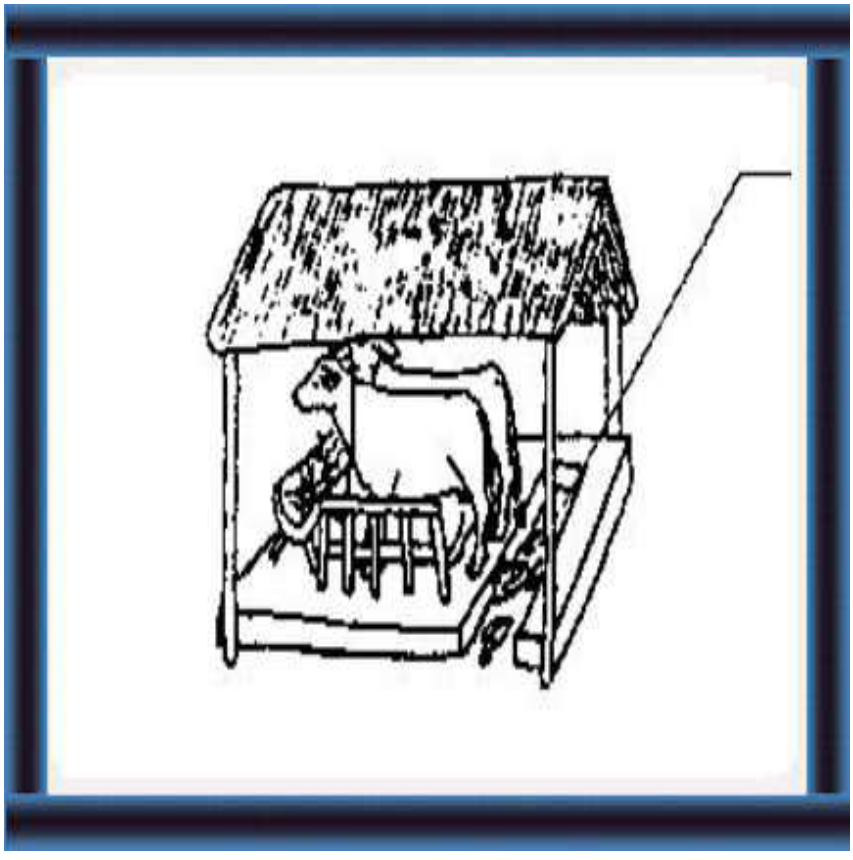
15 You can spread your compost manure **twice a year** on 6-7 rai of cash and forage crops:
- you **do not** need to buy chemical fertilizer.



16 **How much money do you save?**

17 **Health and hygiene**:

It improves hygiene and health.
This farmer leaves **manure** near the milking barn:
- flies and parasites breed, bacteria multiply and it smells bad
- he **cannot** keep his animals clean and dry
- he **cannot** produce clean milk.



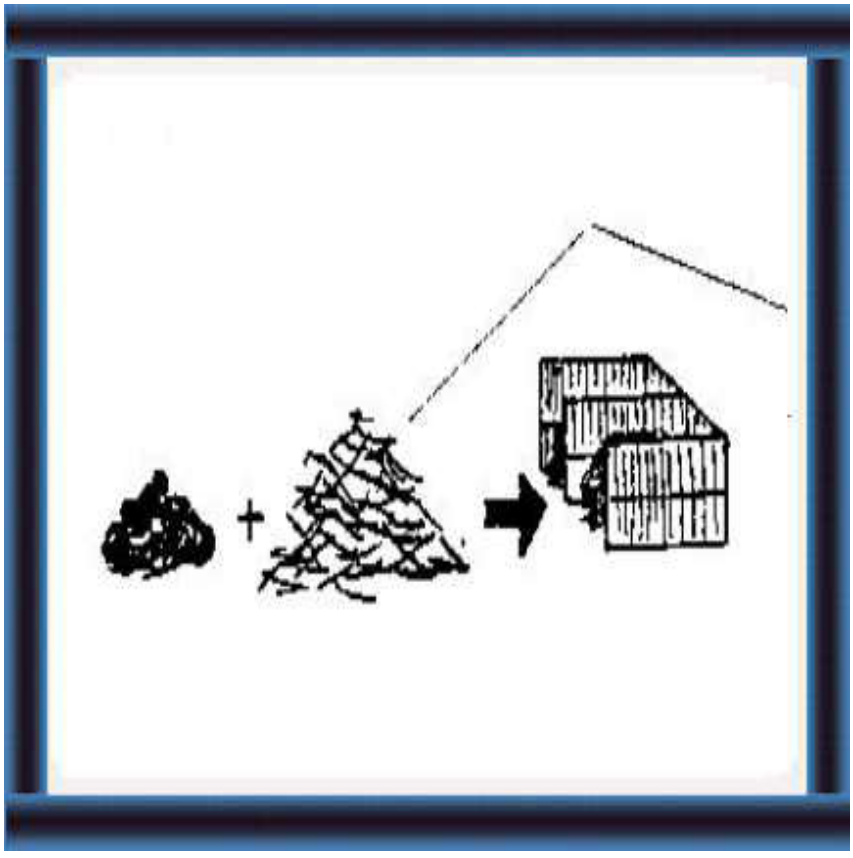
18 This farmer **removes the manure** and makes compost manure:

- he has **clean, dry and healthy animals**
- he produces **clean milk.**

19 **Ease of handling**:

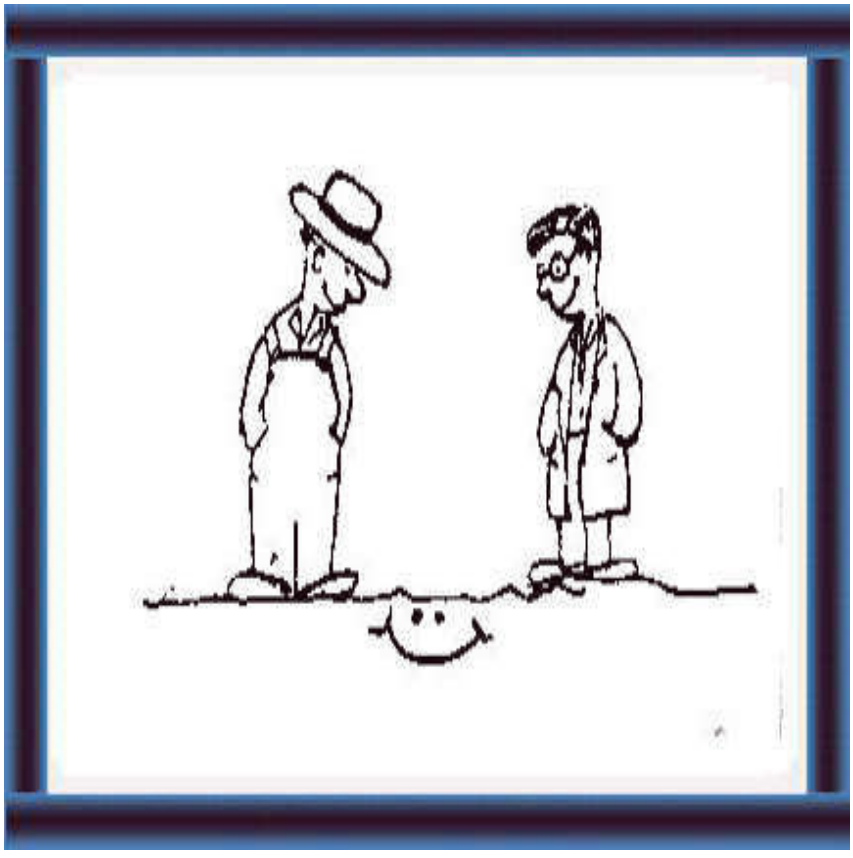
It is easier to handle than fresh manure and improves the soil. If you use **only straw** for compost, it is **too loose and airy.**

20 If you use **only manure** for compost, it is **too wet and heavy.**



21 Cow manure and straw make a good compost manure and also kitchen waste.

Straw:
-**allows air to enter** so the micro-organisms can break down the manure
-**absorbs urine** and helps to keep it in the compost.



22 Good compost manure **improves** the soil's:
- fertility
- texture
- ability to hold water.

How can you make compost manure?

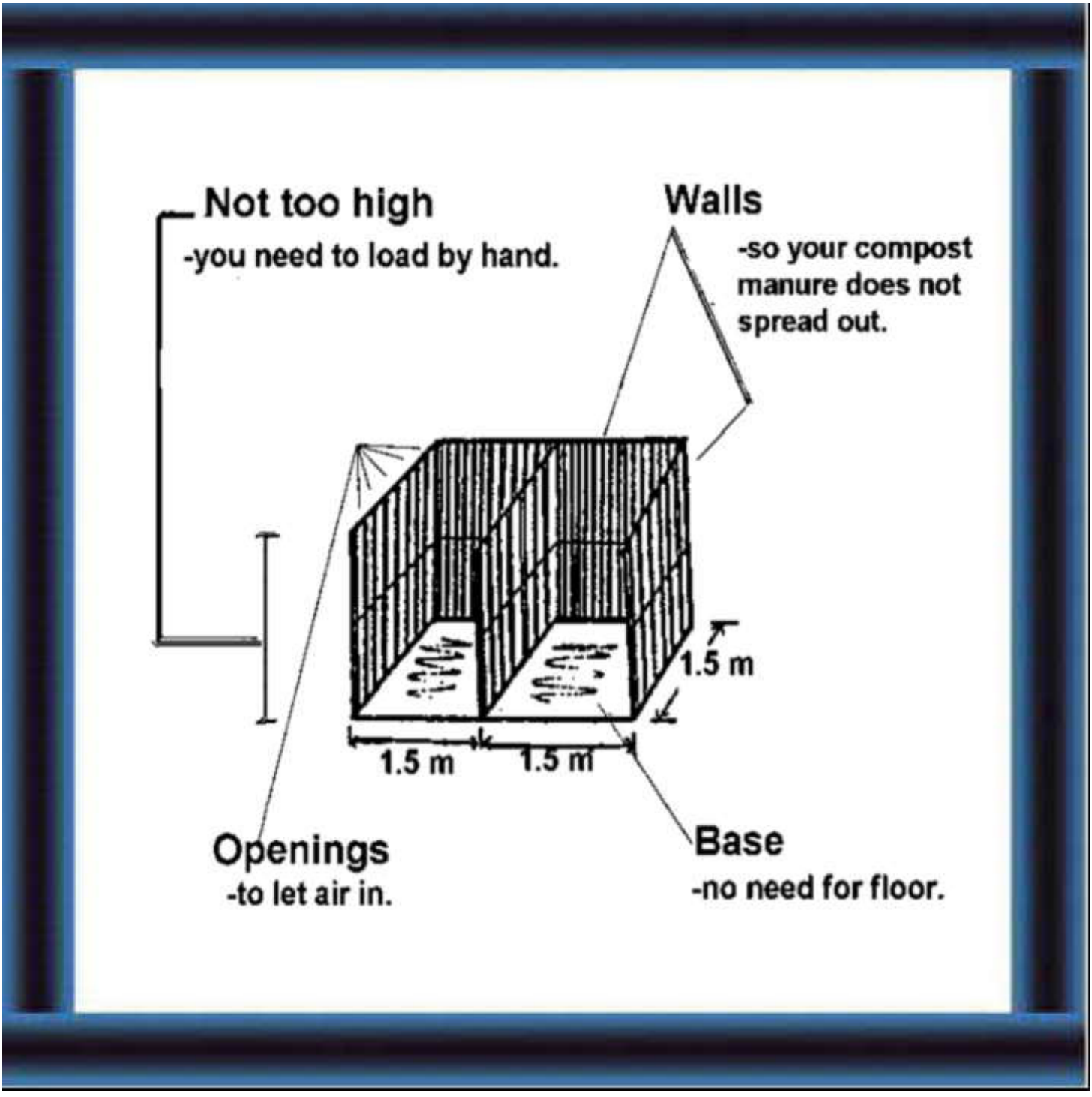
You can make compost manure in a **heap.** This is simple but you **waste** a lot of material.

You can also make compost manure in a **shallow pit.** You waste less material but removal of the compost manure is **difficult**.

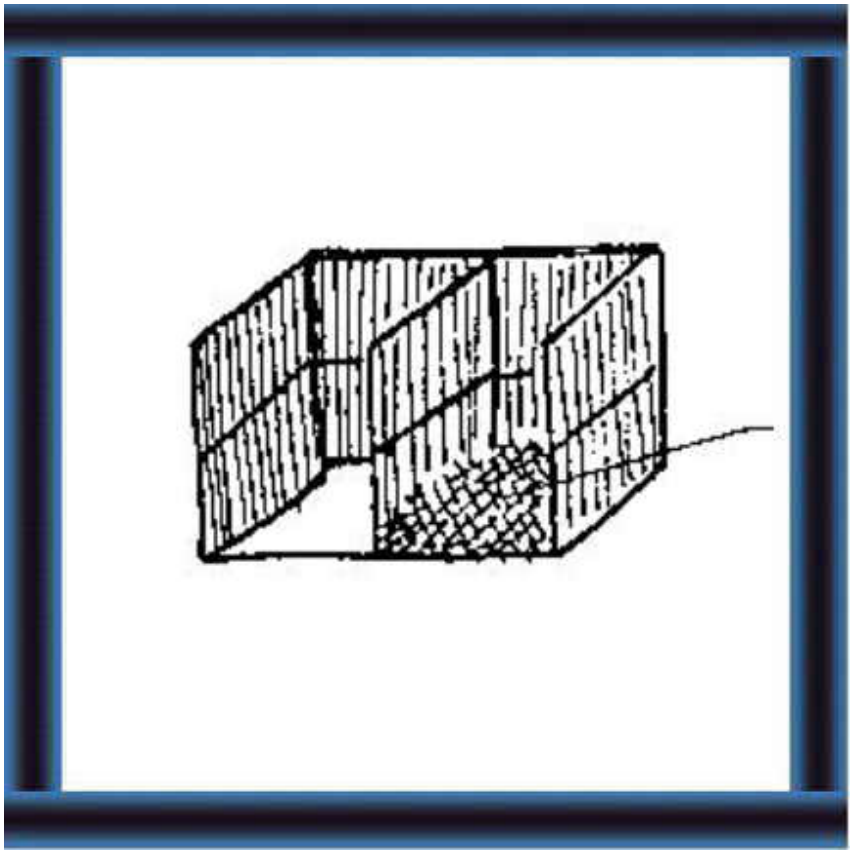
Make a **frame.**

Materials:

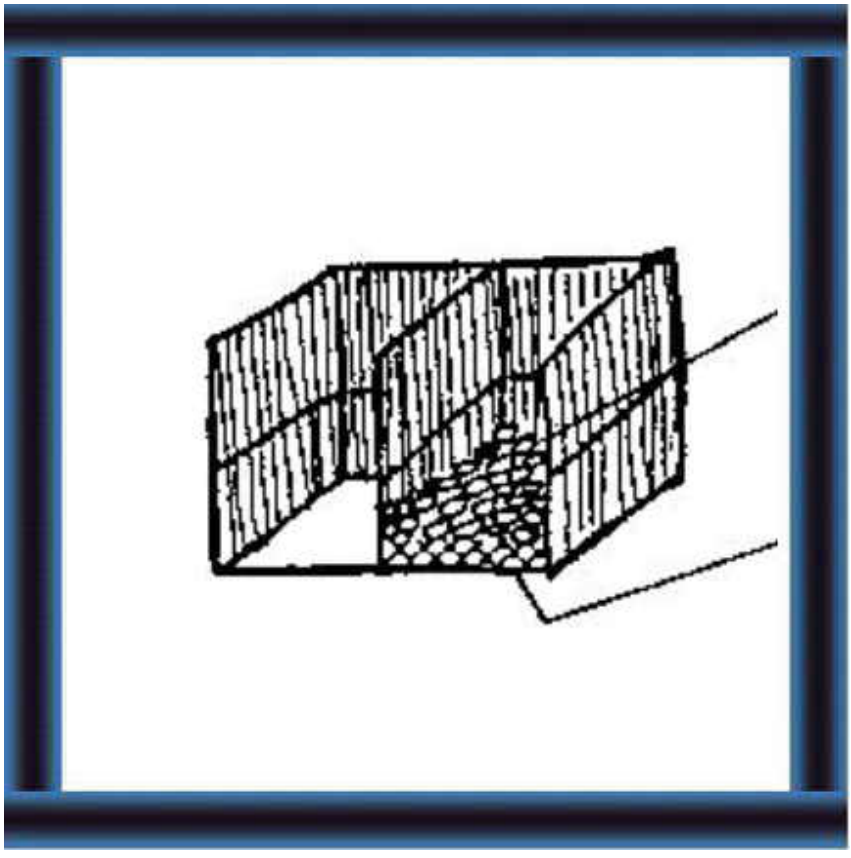
1. You need many pieces of bamboo, wood or other building material - 1.5 m long.
2. Nails or string for fixing.



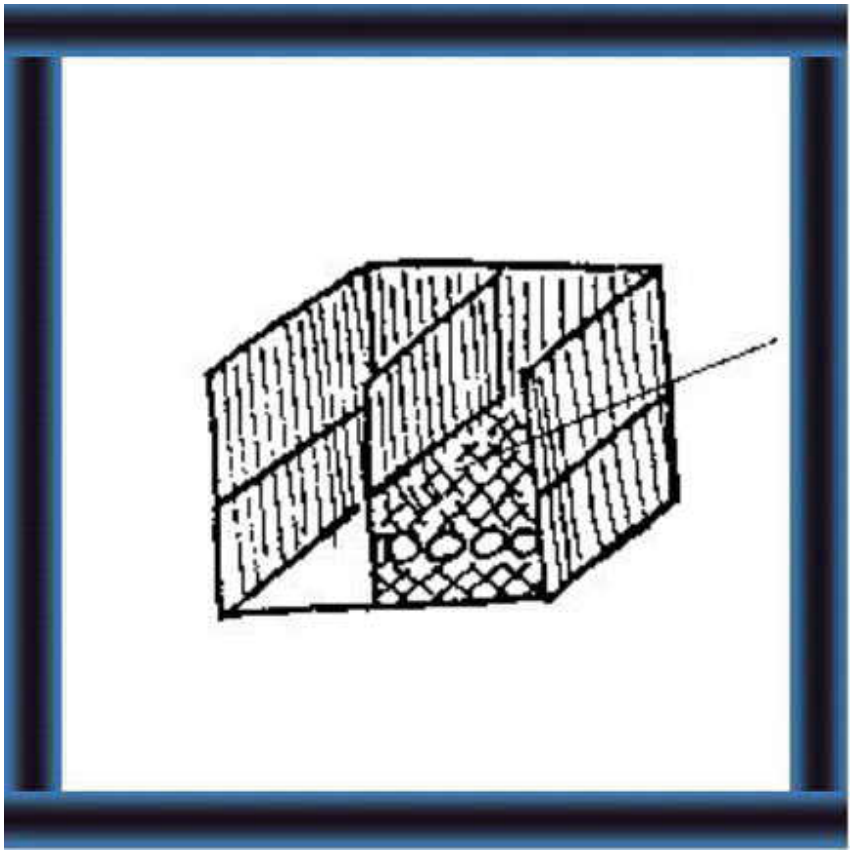
How can you fill the frame?



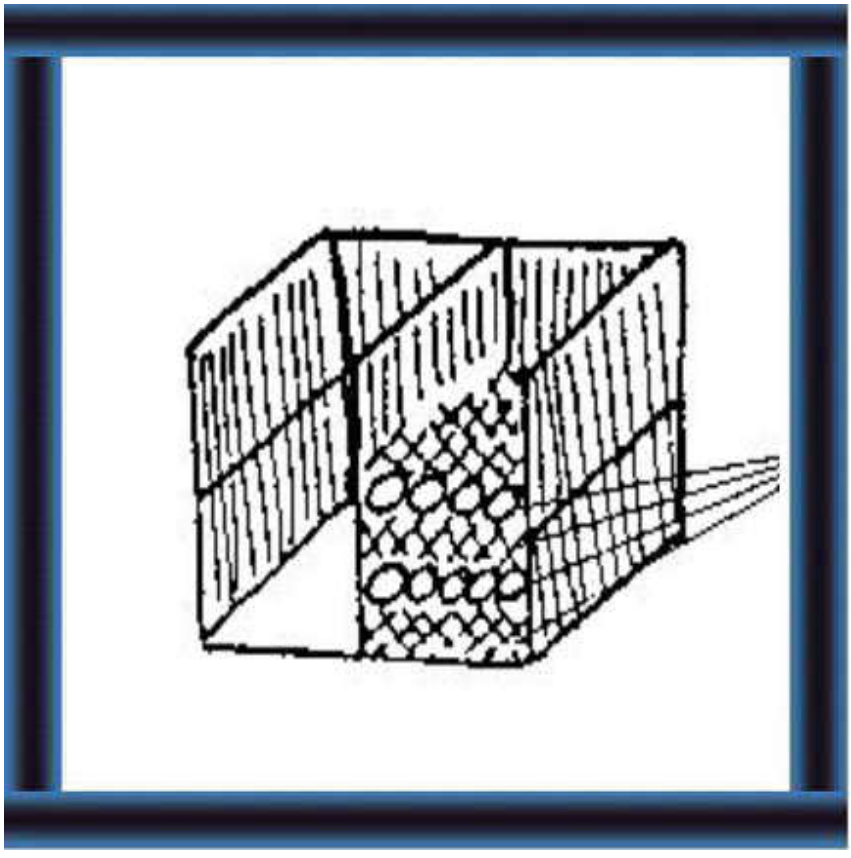
24 Spread a thick layer (25 cm) of **straw** in the bottom of the first box.



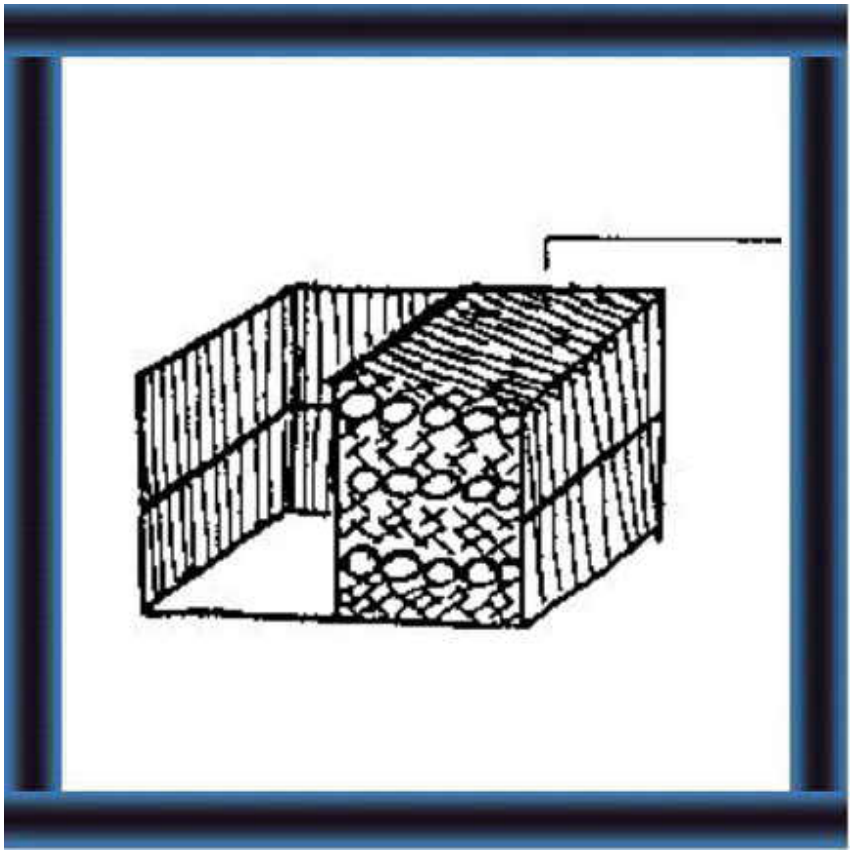
25 Fill **manure** evenly on top of straw (until the manure covers the straw).



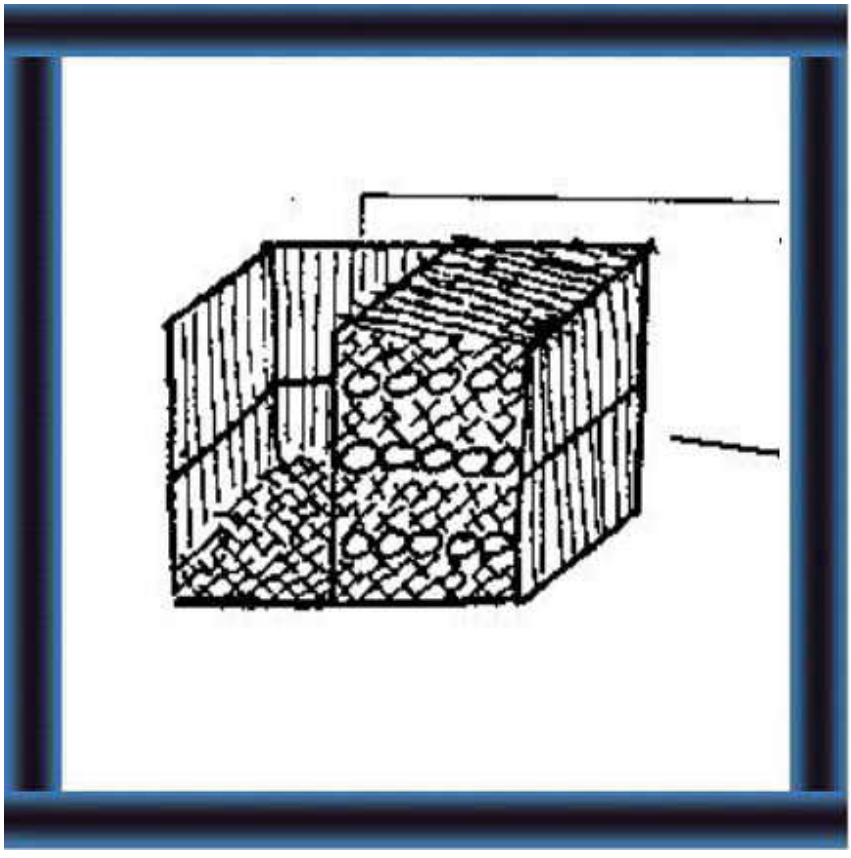
26 Spread a new, thinner layer of **straw** (10 cm) over the manure again.
Mix the straw by fork into the manure.



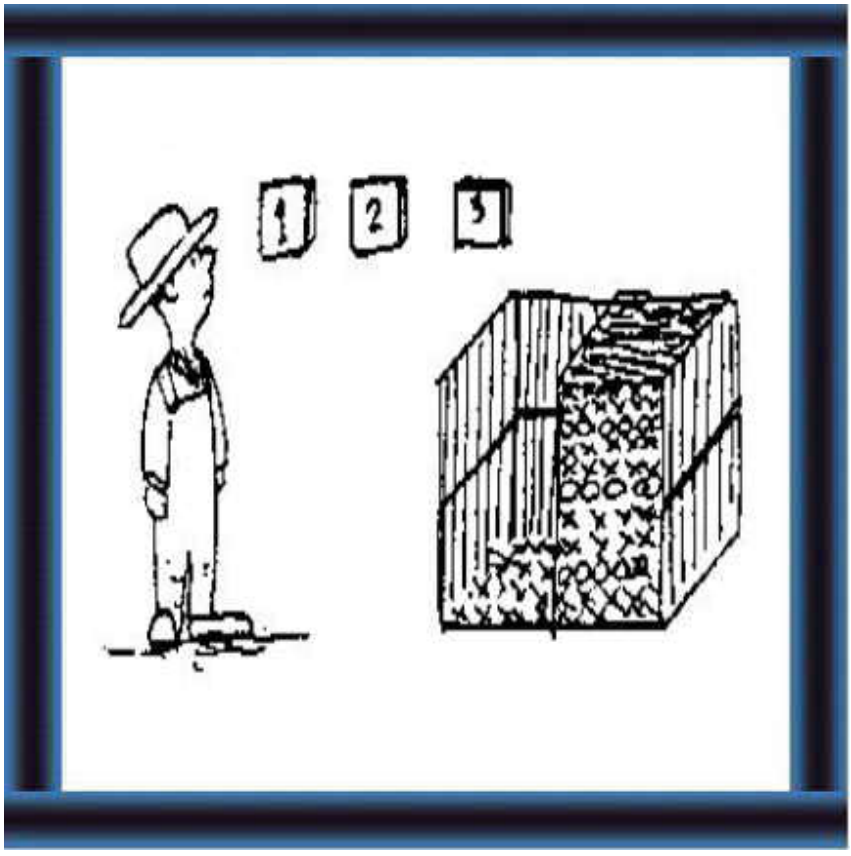
27 Keep on filling up the frame with **layers** of manure and straw.
Make sure there is no thick layer of manure or straw, where the two are not mixed together.



28 You can fill the first box in a few months.
Cover the heap with **straw** to protect against rain.
Leave for **at least 4-6 weeks** before using.



29 Fill up the **second box** in the same way **while** you use material from the first box.

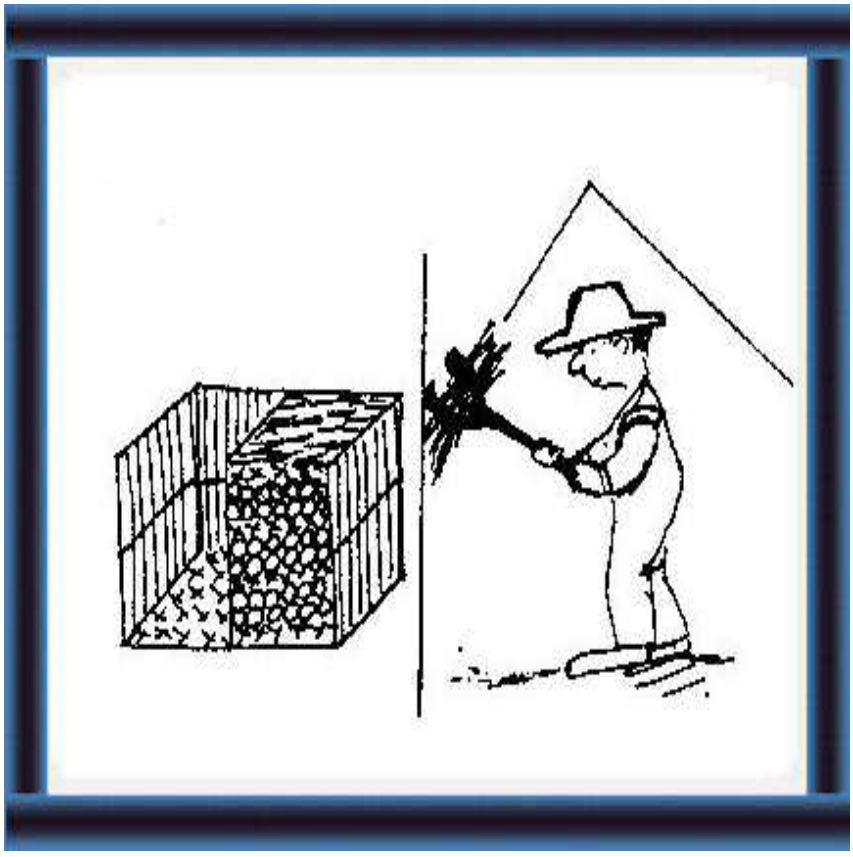


When can you use the compost manure?

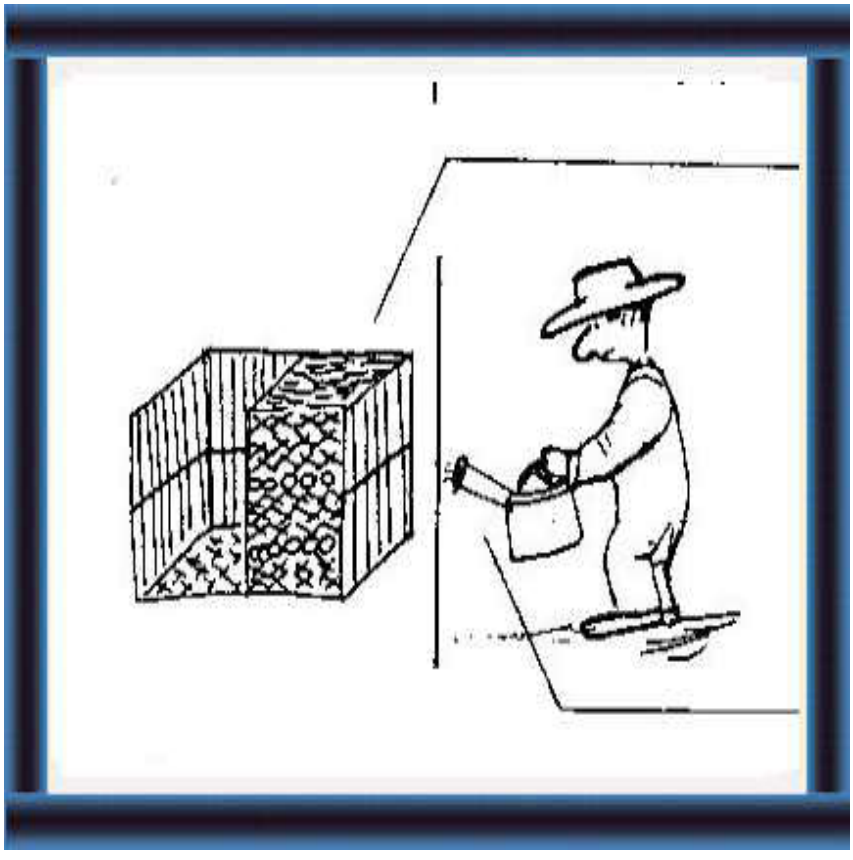
30 The compost manure becomes warm and begins to break down.
You can use it **after 2 months** if it is the planting season and you need it as fertilizer.
After **6-8 months** it is like humus and this is the **best** time to use it.
You can use it **after 8 months** but it gets **weaker with age.**

IMPORTANT

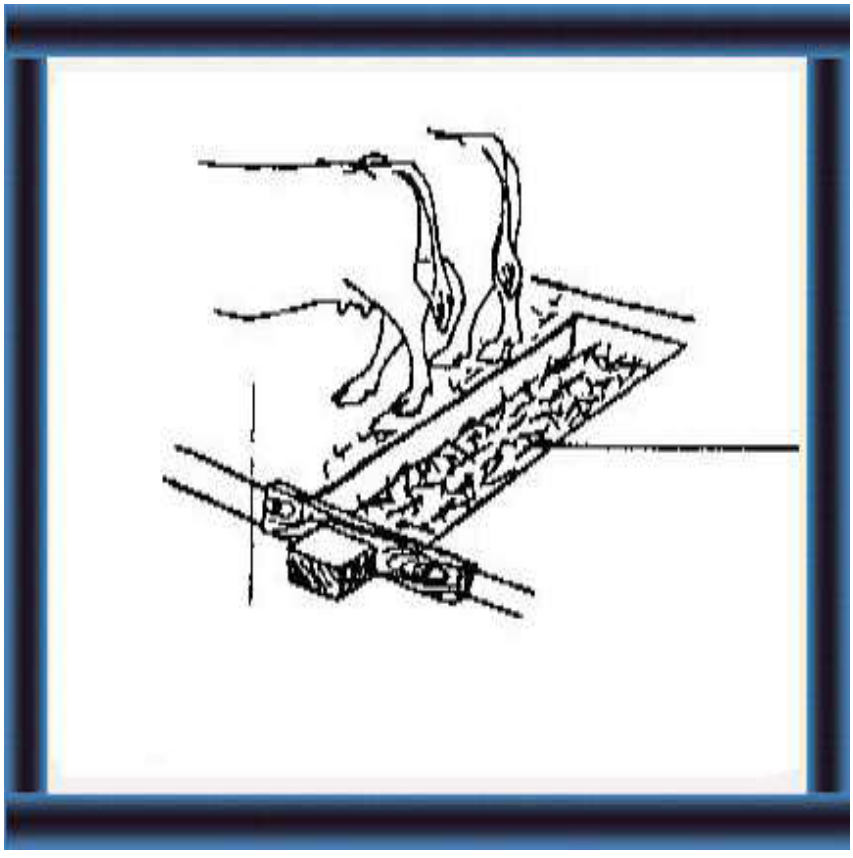
31 If the heap is **too**



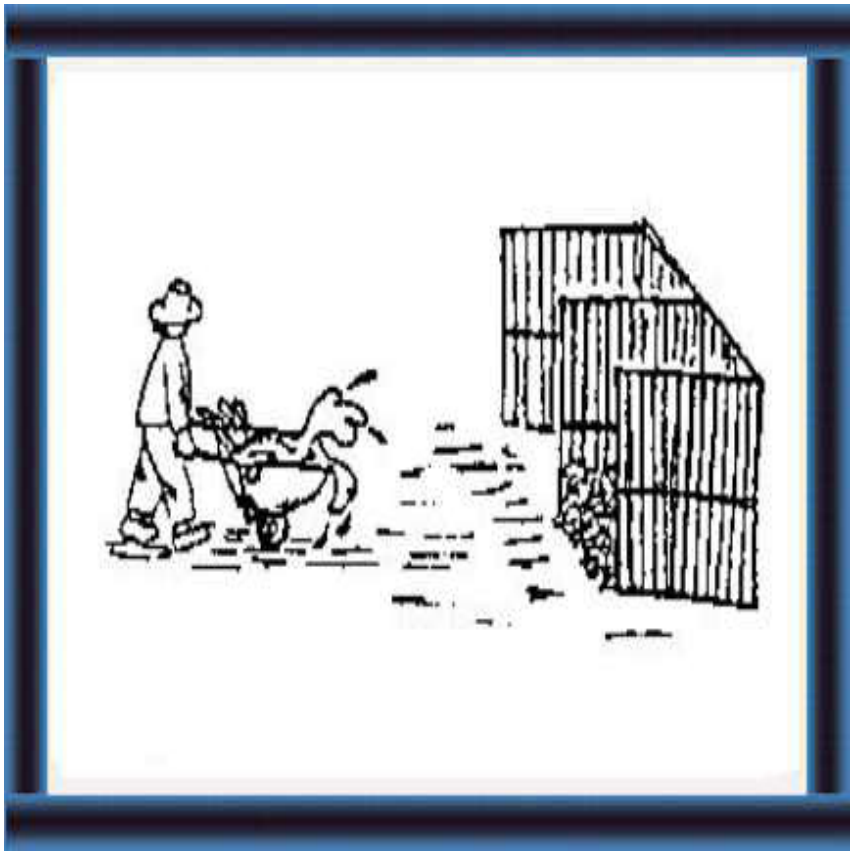
wet and compact, it will **not** break down:
- add more straw.



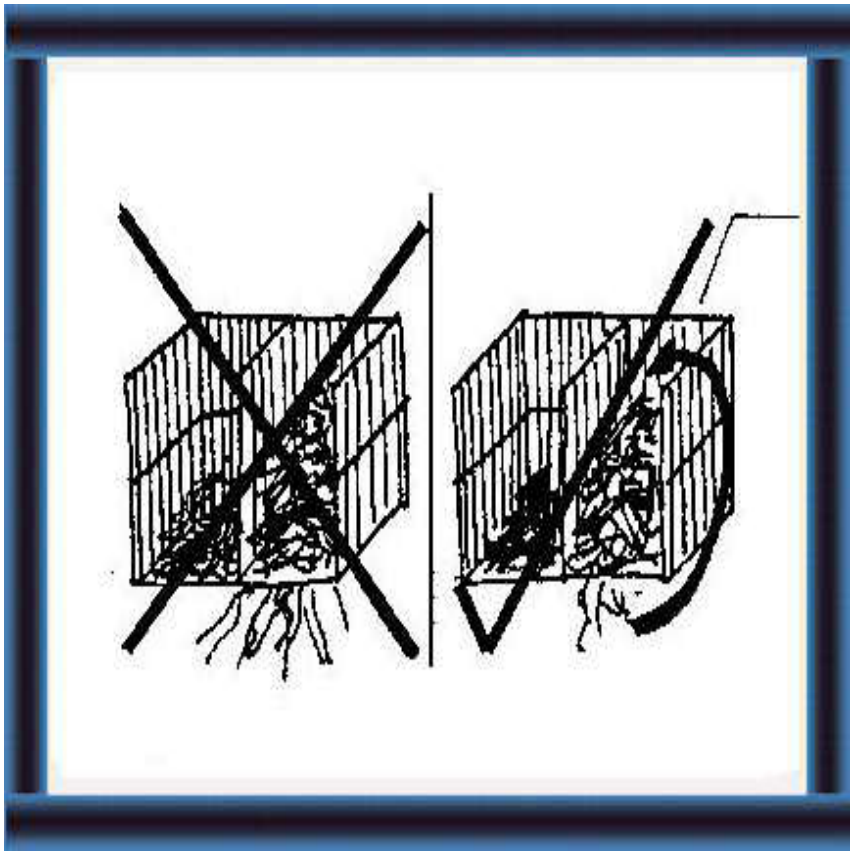
32 If the heap **is too dry and loose,** it will **not** break down:
- add water.



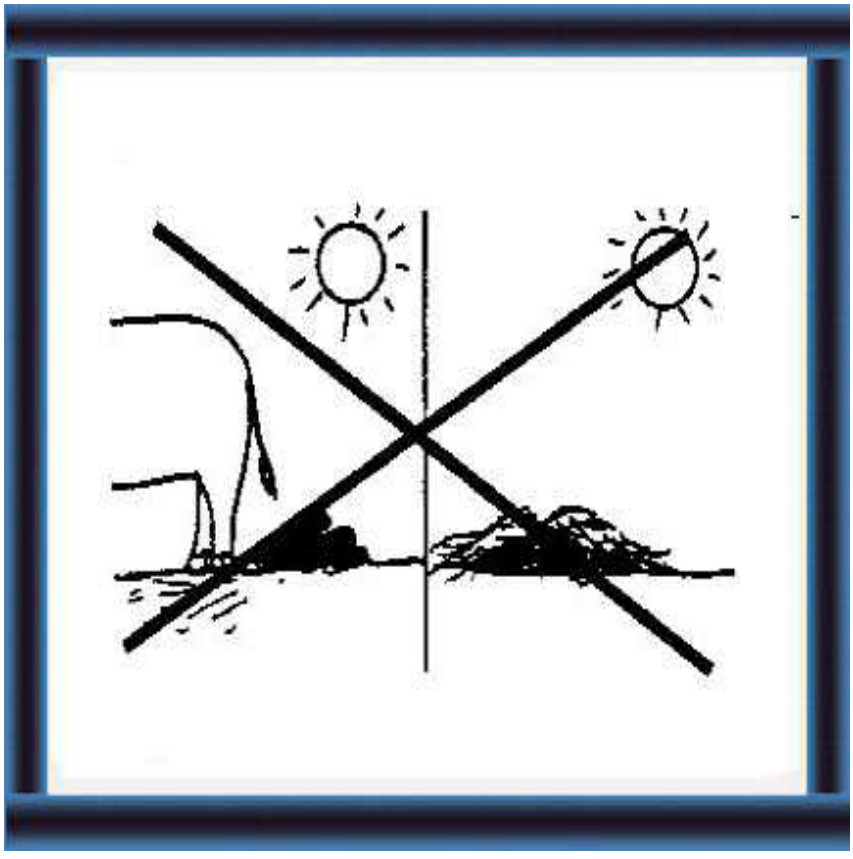
33 If you allow urine to run away, you **lose nitrogen and potassium**:
- you can put **dry straw** or **dry soil** in the gutter to absorb the urine



34
- bring the manure and the soil or straw **soaked with urine** to the heap



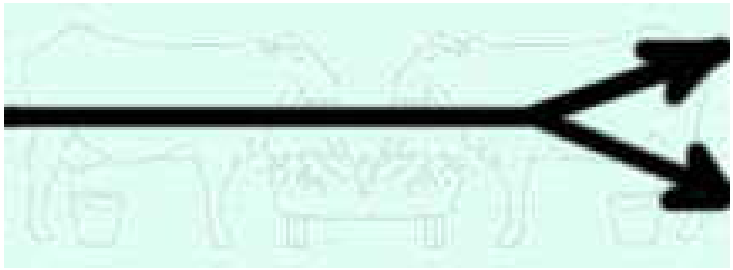
35
- add the mixture to the **top** of the heap
- make sure you have **enough** straw in the heap to absorb the urine



- **cover** the heap **with a layer of straw.**
36 **Do not** leave manure in the air and sunlight:
- it will **lose** nitrogen.

What do you know about compost manure?

Compost manure



plant matter
+
animal manure

(5-8)

- kept dry
- left for few months

Reasons for using compost manure

plant nutrients (9-12)	Economy (13-16)	Health / hygiene (17-18)	Handling (19-22)
- organic matter - nitrogen - phosphorus - potassium - magnesium -calcium - sulphur - copper	Compost manure from 2 cows yields: - 200 kg urea - 100 kg phosphate	Cleaner milk results from: - cleaner barn - less flies, bacteria and parasites	- easier to handle than fresh manure - better structure for soil

Making compost manure

Frame

1 Prepare materials (23)
   - wood / bamboo, nails / string
2 Make frame at correct height

Filling frame (24-28)

Saving urine and manure
Add alternate layers of straw and manure
Mix each layer carefully
Check moisture and looseness
Cover with straw when full to keep dry

Using compost manure

Timing	
Use compost manure from one box while filling second	(29)
Compost manure is best 3-6 months after making	(30)

Important points	
Dryness and compaction	(31-32)
Conserving urine	(33-35)
Conserving nitrogen	(36)

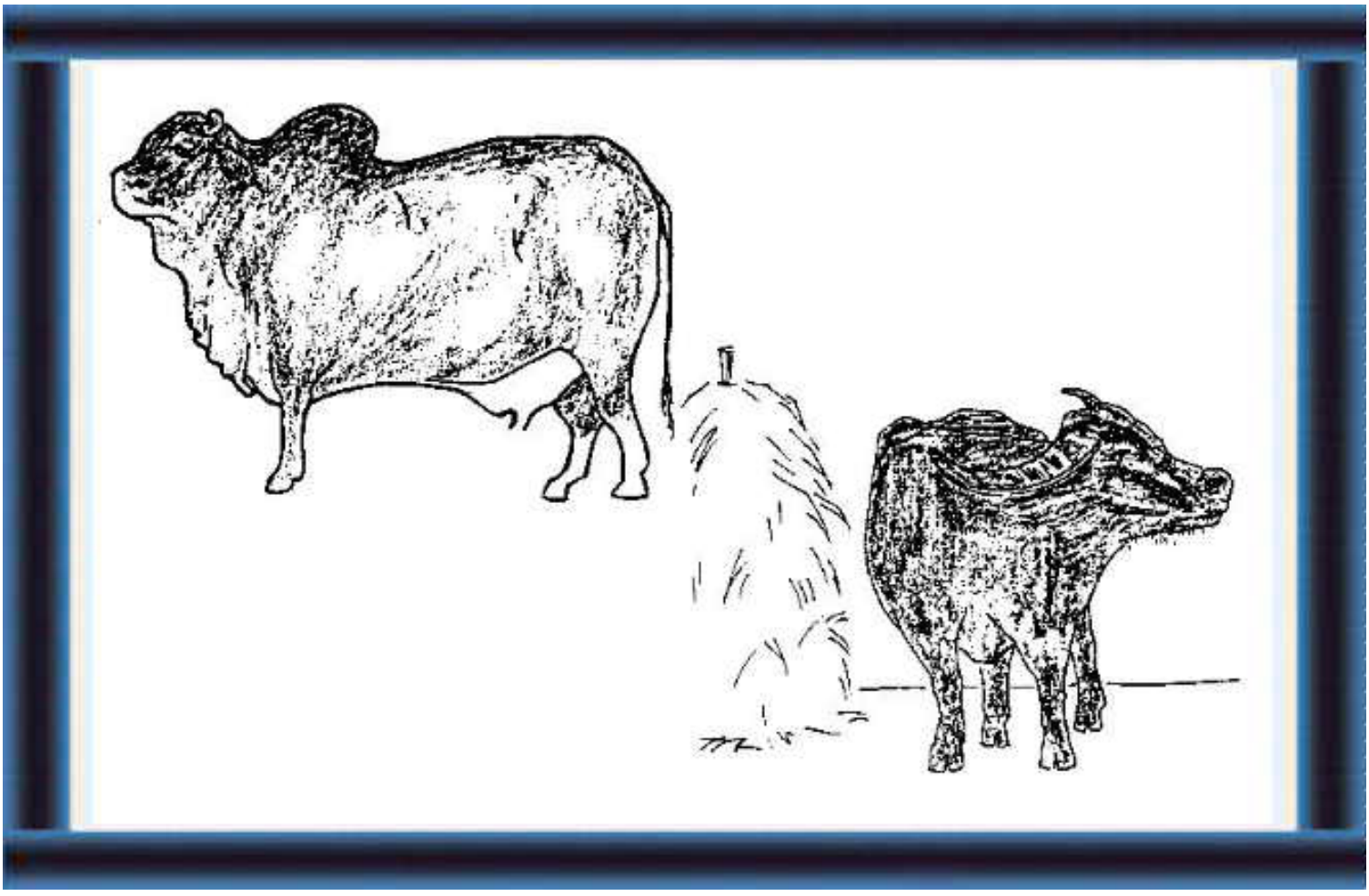
Small-Scale

Dairy Farming Manual

Volume 2

Husbandry Unit 2

BREEDS OF DAIRY CATTLE AND BUFFALO



BREEDS OF DAIRY CATTLE AND BUFFALO

Husbandry Unit 2:

Technical Notes

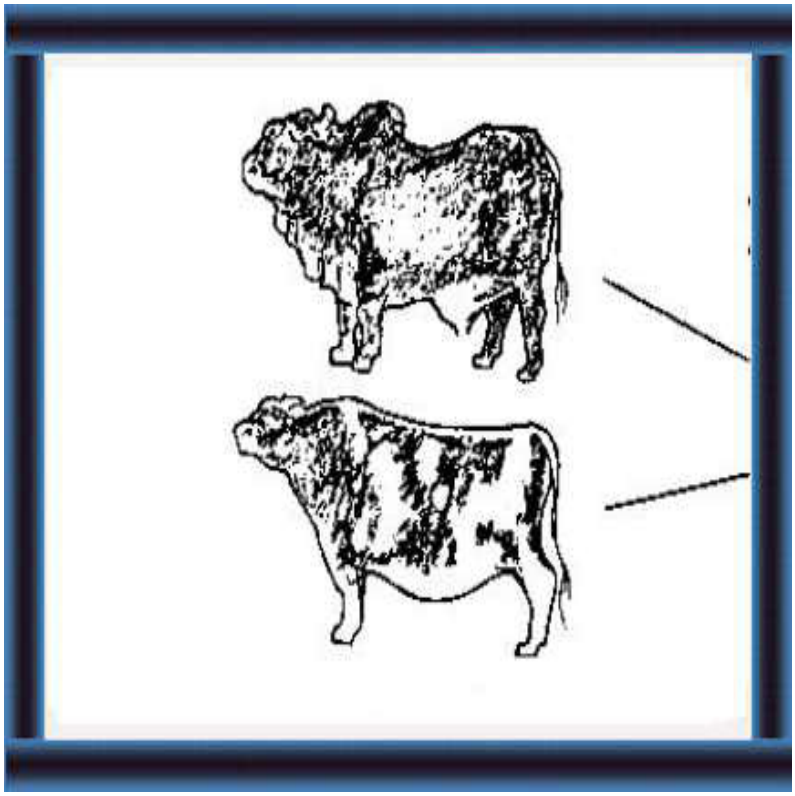
Note: Numbers in brackets refer to illustrations in the Extension Materials.

Extension Materials

What should you know about breeds of dairy cattle and buffalo?

What do you look for in different breeds? (5-12)

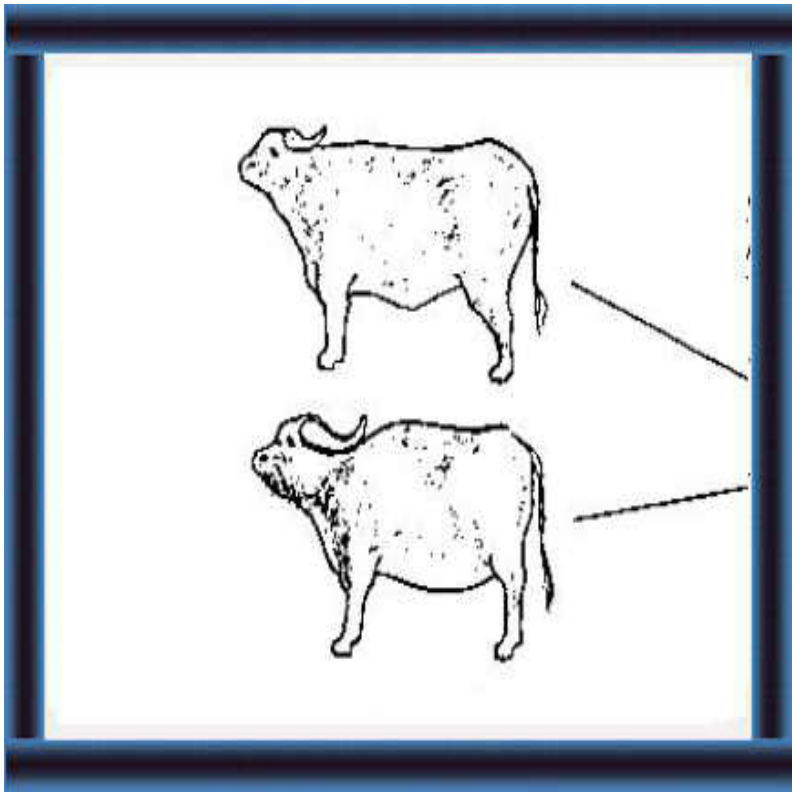
1 Animals that are:
- happy in local conditions
- have good production.



What are the major groups of dairy cattle? (13-32)

2 There are two major groups:
- Zebu (Bos indicus)

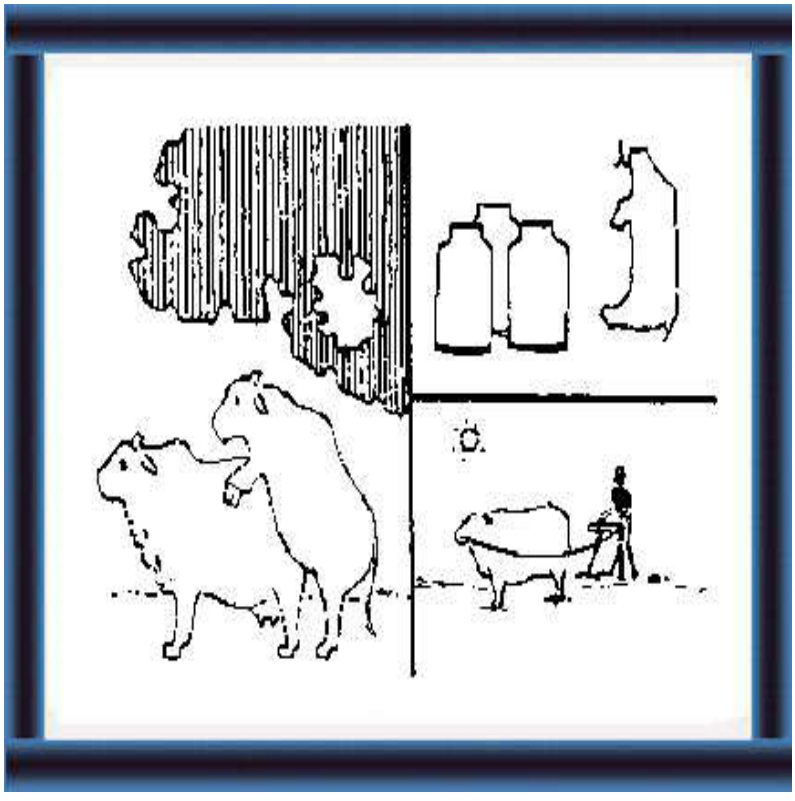
- European or temperate (Bos taurus).



What are the major types of dairy buffalo? (33-46)

3 There are two major types:
- River buffalo

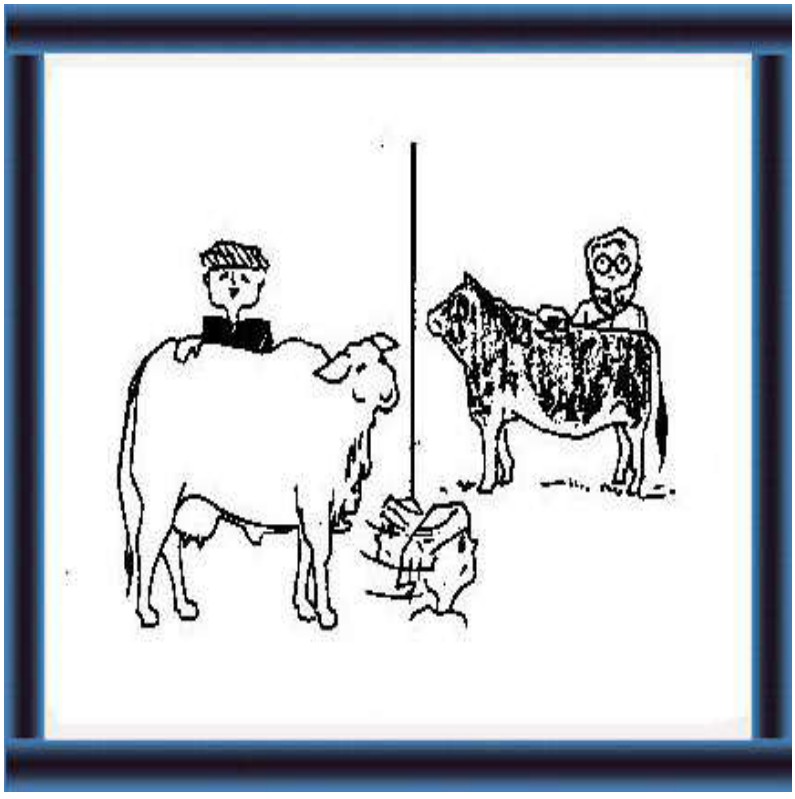
- Swamp buffalo.



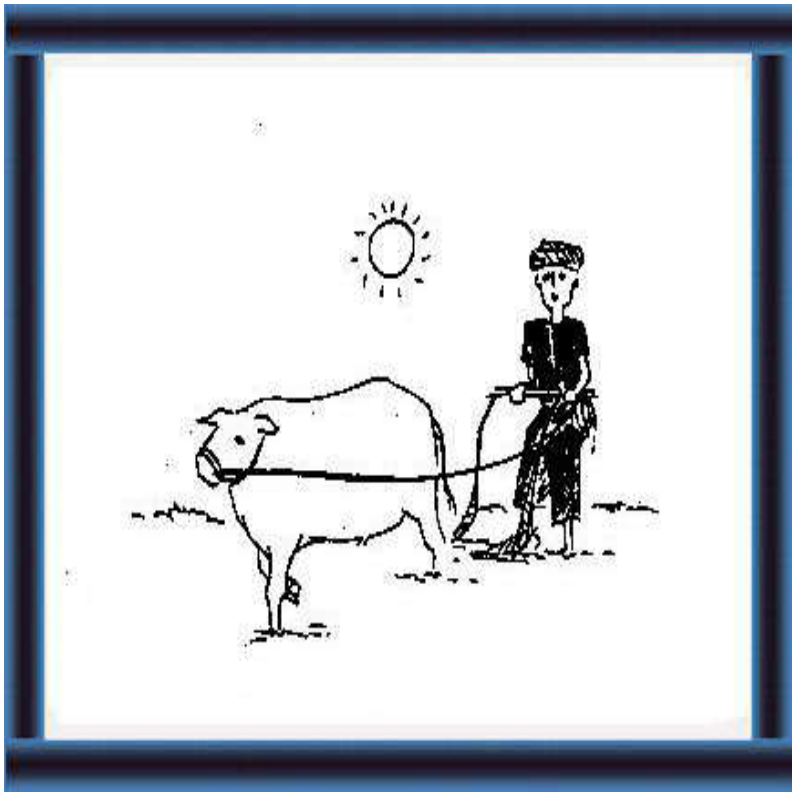
What is the purpose of breeding dairy cattle and buffalo and how can you do it? (47-68)

4 To get animals which are:
- happy in local conditions
- have better production through selection and cross-breeding.

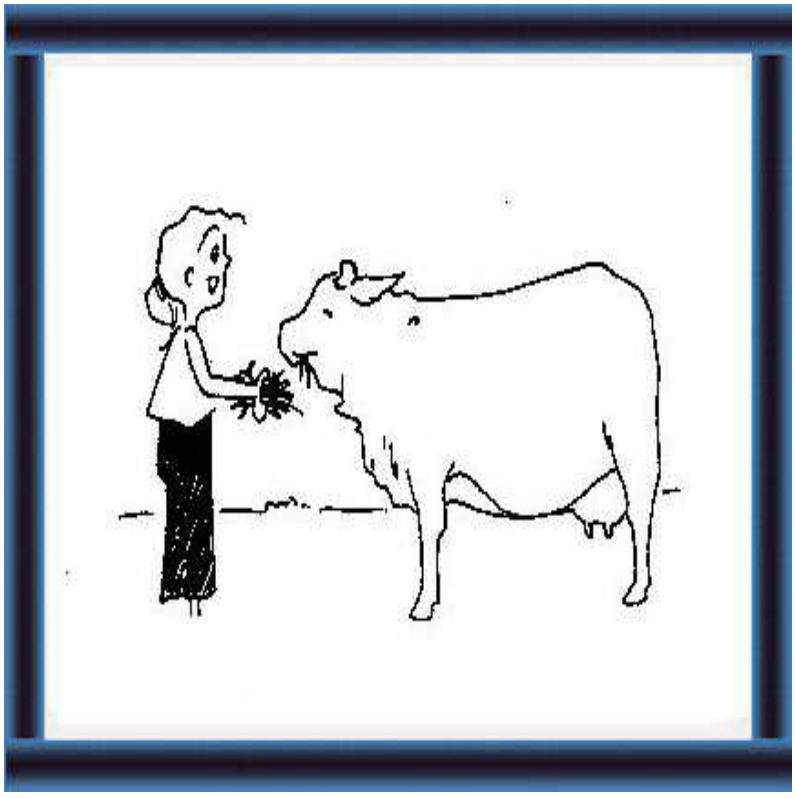
What do you look for in different breeds?



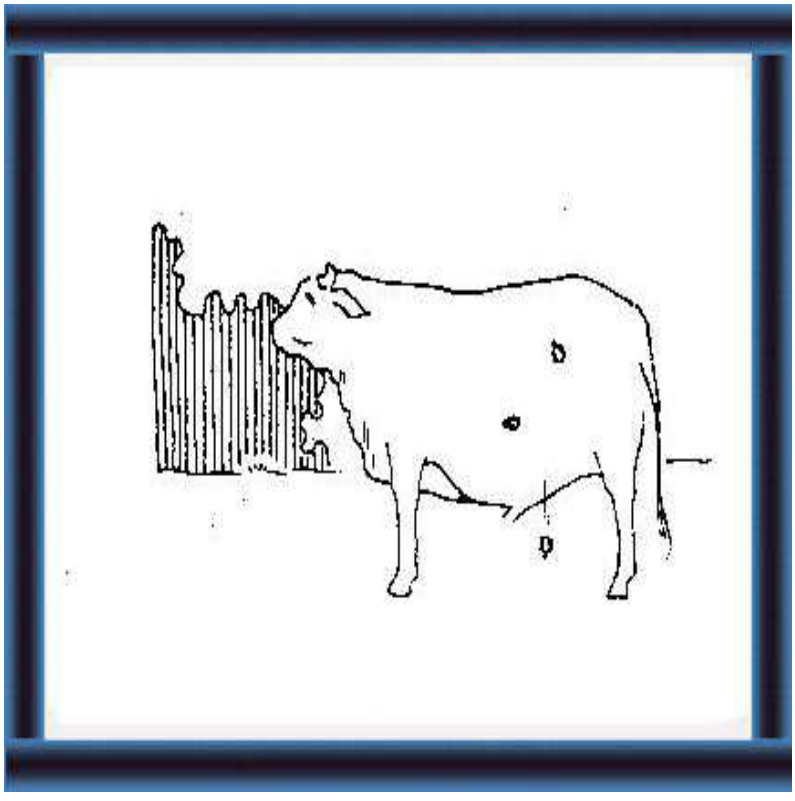
5 You want a breed that:
- does well on your **own farm** and gives high milk yields



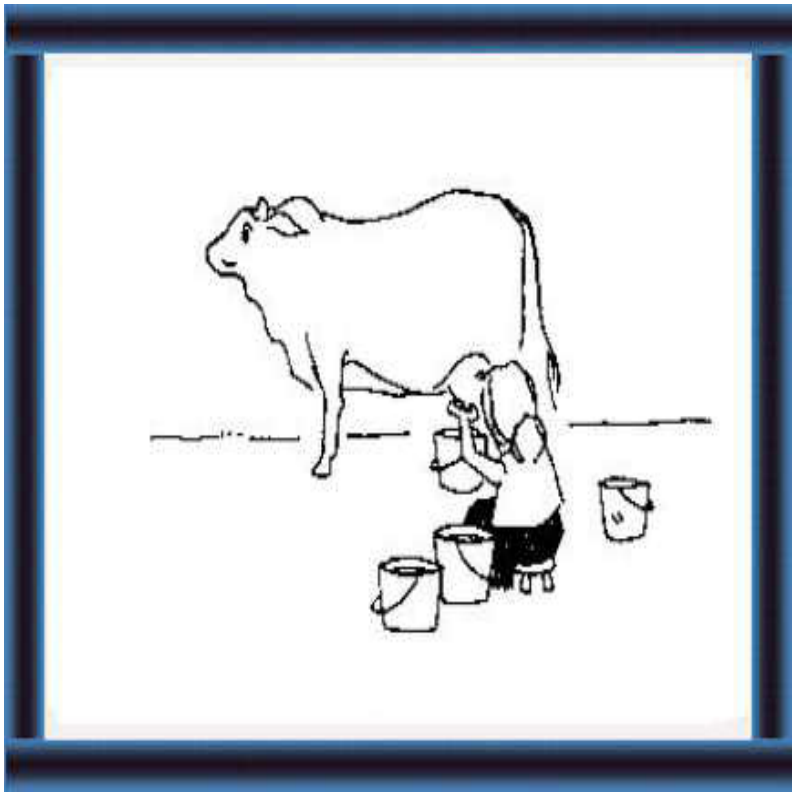
6
- can **stand** the **heat**
- is a strong **draught animal** (if you use for draught as well as milk production)



7
- has **low food** requirements



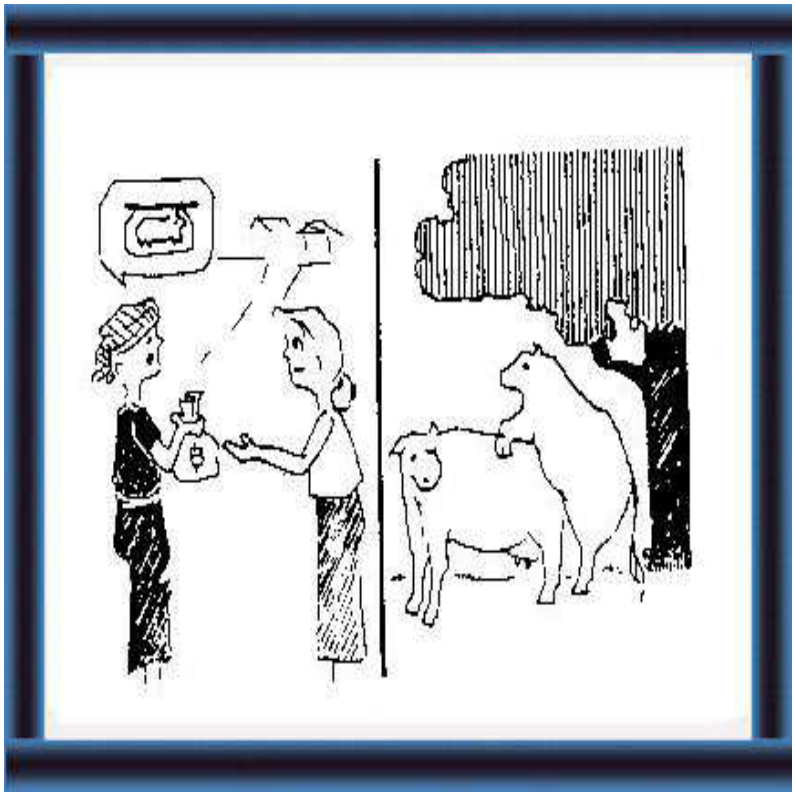
8
- **stands disease**, especially tick-borne disease.



9 You want good:
- **milk production**

10
- **milk composition**

11
- **meat production** (many countries).



12 You should think about these things:
- when you **buy** cattle or buffalo
- when you **breed** them.

Dairy cattle breeds

Domesticated cattle are normally classified into two major groups, Zebu (Bos indicus) and European or temperate (Bos taurus). Even though there are substantial physical and physiological differences between the two groups, they can be interbred readily to produce fertile offspring of both sexes. (13-14)

Bos indicus group

This group is also called "the humped cattle". The size and shape of the hump vary by breed, sex and age of animals. Other external features common to most Zebu cattle are narrow body, rather long legs and well developed brisket and dewlap, particularly in the males. (15)

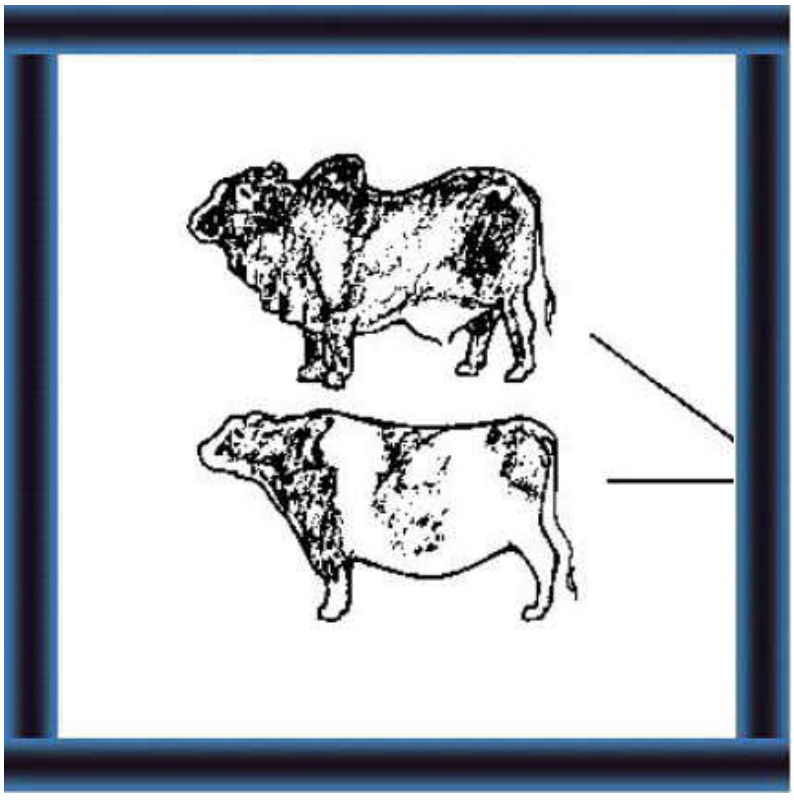
The most important characteristic of this group is its adaptation to the tropical environment. This adaptation derives from three main aspects: (16)

- a high degree of heat tolerance partly due to low heat production (associated with low metabolic rate and low productivity) and partly due to a high capacity to dissipate heat;

- low nutritional requirements, mainly due to low metabolic rate and small size and also possibly to more efficient digestion at low feeding levels;

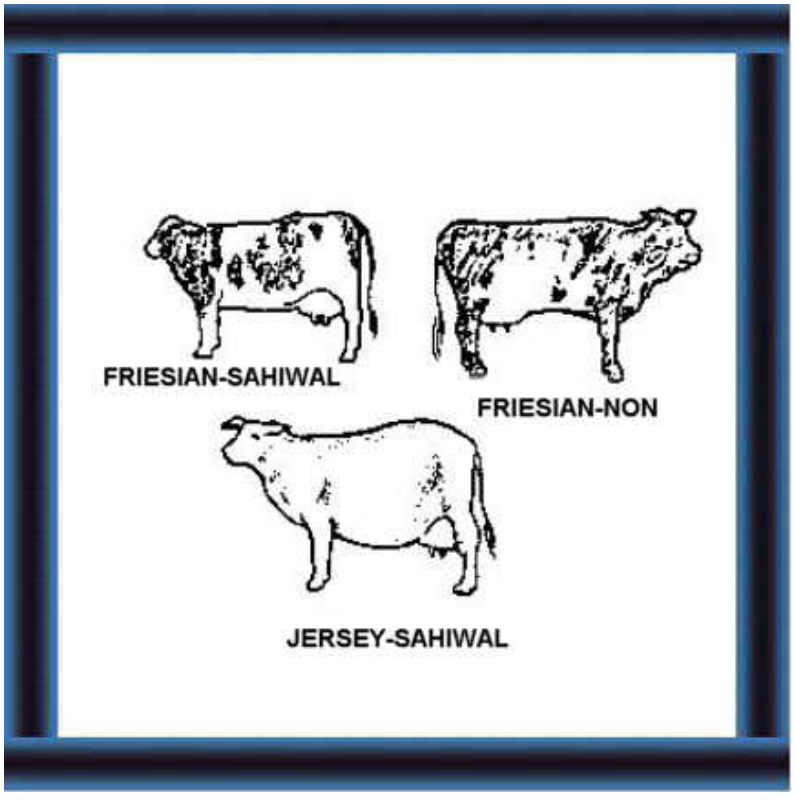
- a considerable degree of resistance to ticks and also to many tick-borne diseases prevalent in tropical countries.

What are the major breeds

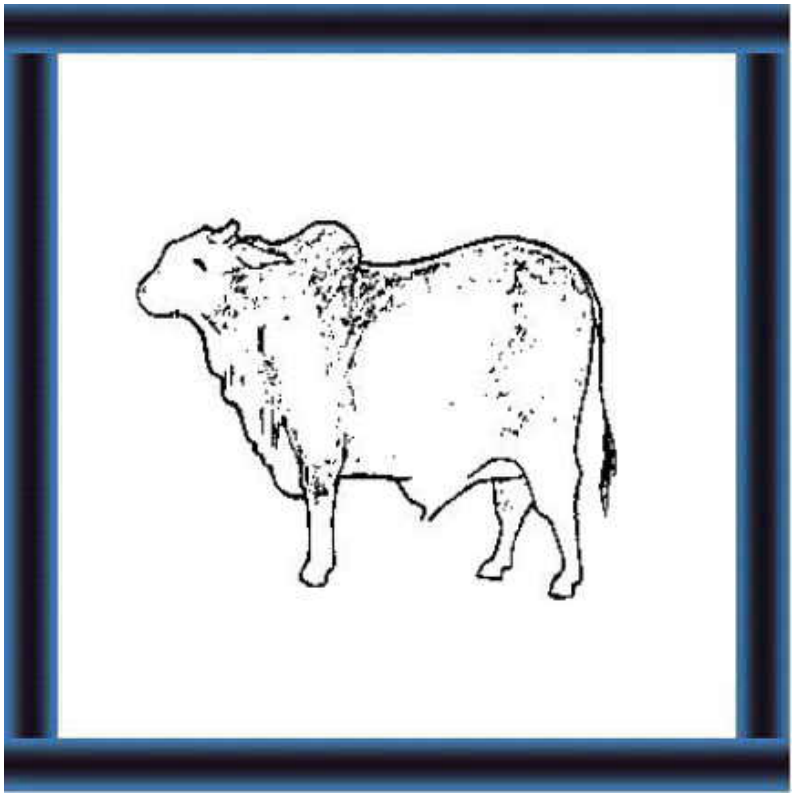


of dairy cattle?

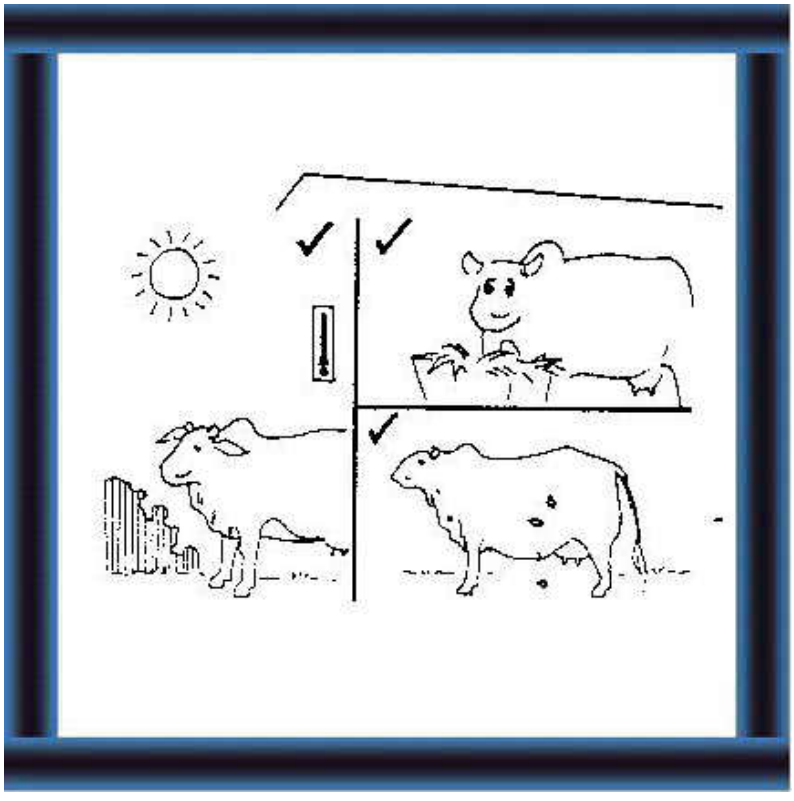
13 There are two major groups:
- **Zebu** (Bos indicus)
- **European or temperate** (Bos taurus).



14 The groups are very different but **cross-breeding** can produce fertile offspring of both sexes.
Zebu (Bos indicus)

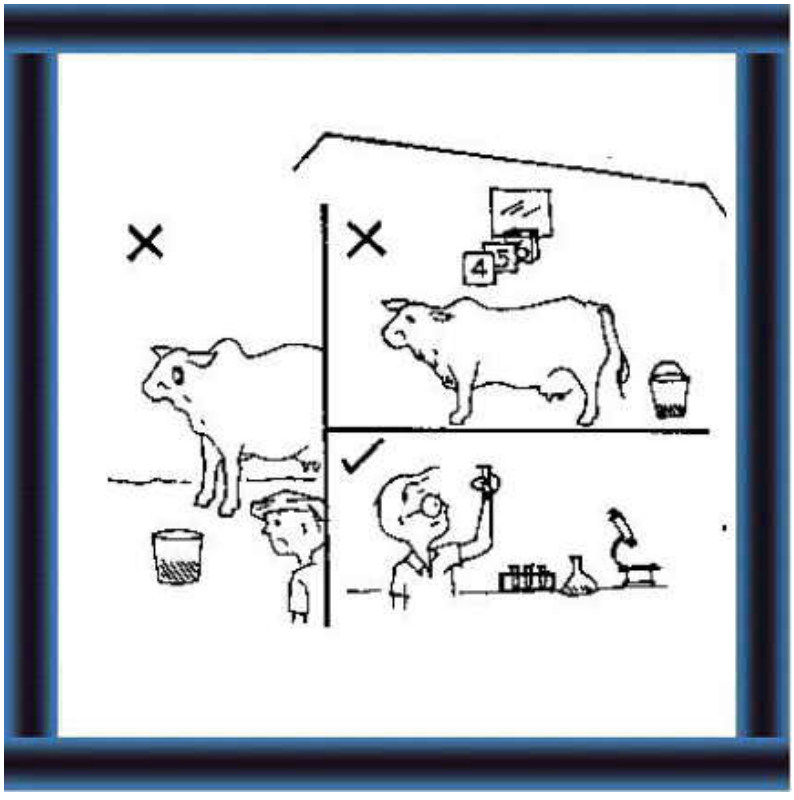


15 Another name for this group is "humped cattle". The size and shape of the hump depends on:
- breed
- sex
- age.



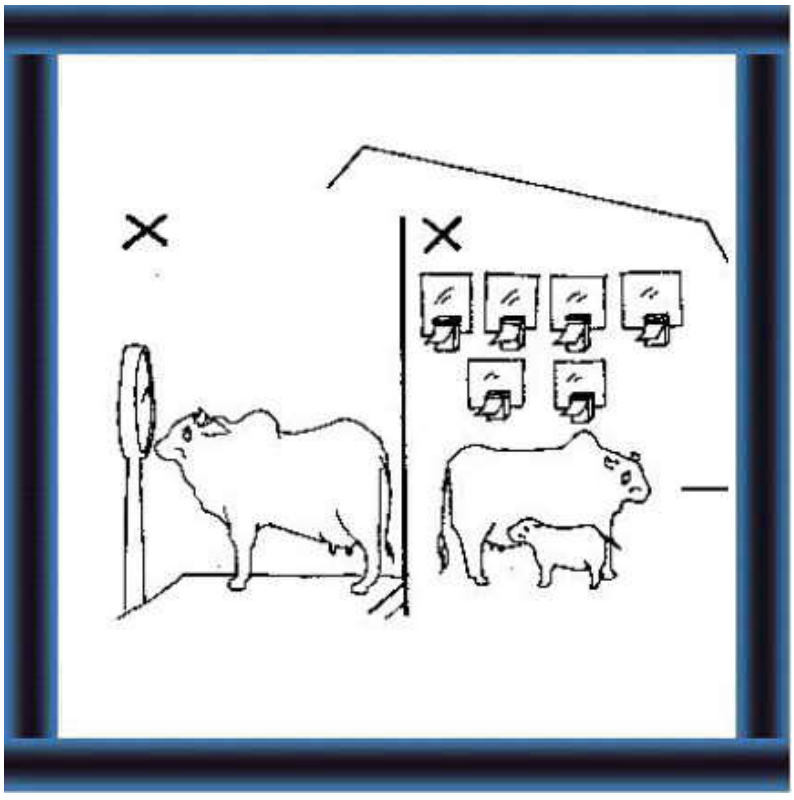
16 Zebu cattle live well in tropical conditions. They can:
- stand **heat**
- live on **little food**
- resist **disease**.

With regard to production traits, this group is characterized by low productivity. The milk yields are low with short lactations. They also have low weight gains and are late maturing with delayed first calving. An important trait is the higher fat and solids-not-fat content of the milk when compared with the Bos taurus group. (17-18)



17 Zebus have:
- **low** milk production
- **short** lactation periods.

But the milk has **higher fat** and **solids-not-fat content** than the Bos Taurus group.



18 They have:
- **low** weight gains
- **late** maturity and first calving.
Sahiwal especially are selected for improved production.

A large number of Zebu breeds have been described, each country in the region having one to several breeds. Most of these breeds are of importance only in their home countries.

The more important breeds of Zebu cattle are Sahiwal, Red Sindhi, Tharparkar, Hariana, Kankrej, Gir and Ongole.

Sahiwal, Red Sindhi and Tharparkar breeds (19-24)

All these three breeds have originated in present day Pakistan. Although distinguishing external characteristics have been described for each breed e.g. skin colour (Red Sindhi -reddish brown; Tharparkar - white or light grey; Sahiwal - greyish red or brown), the more recent selection criteria for the Sahiwal have been based on productivity traits.

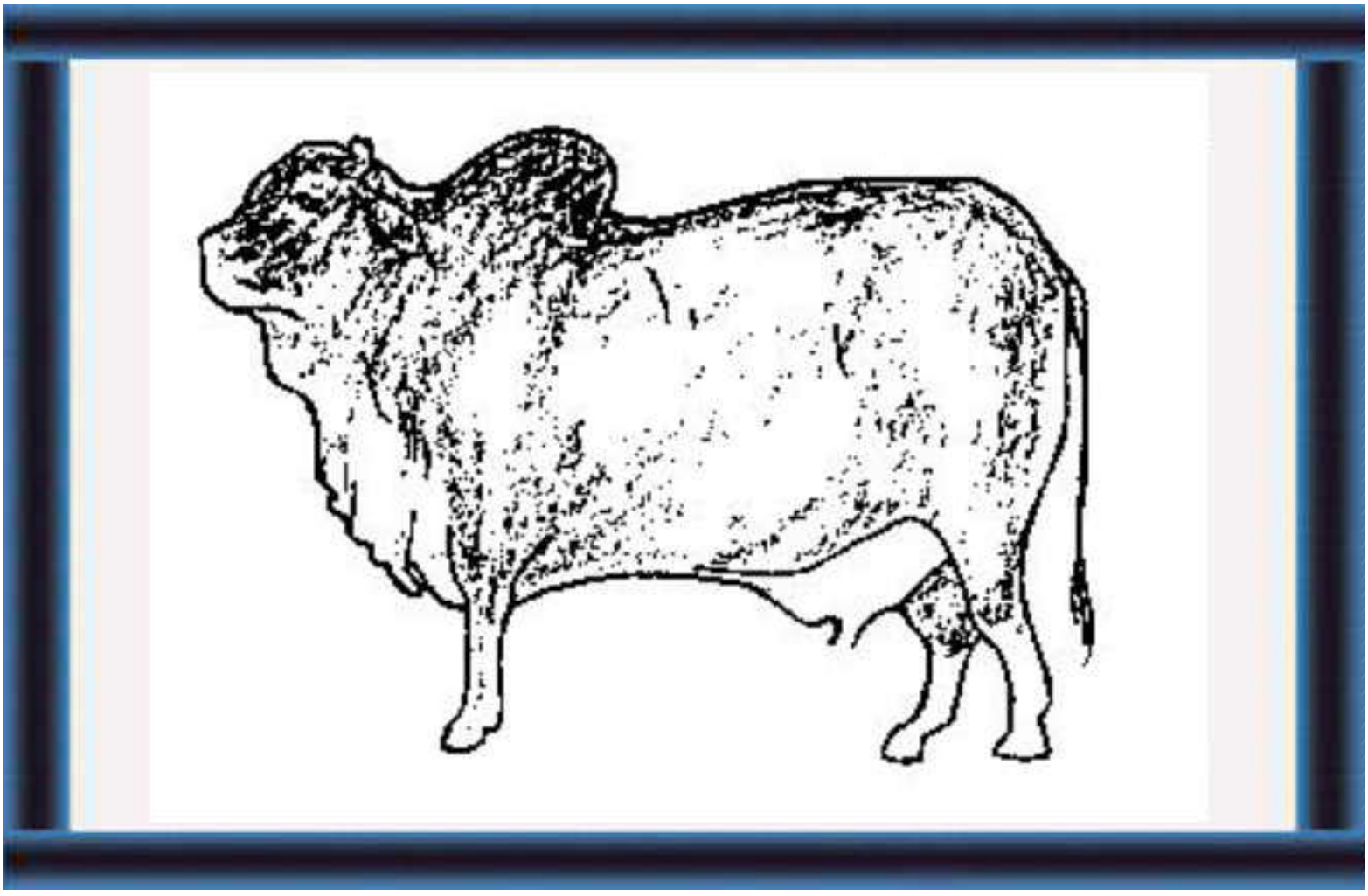
Identification based on external characteristics is, therefore, quite difficult.

The mature cows of Red Sindhi and Sahiwal breeds have an average weight of about 300 to 350 kg while the Tharparkar is slightly bigger. The average milk yields have been estimated at 2,000 kg per lactation with 5 percent fat. Individual cows of the Sahiwal breed in some herds in Pakistan are reported to have produced about 5,000 kg in a lactation.

Sahiwal is the breed that has been mostly used for breed improvement in countries other than Pakistan, the other two breeds having been used only to a limited extent. It is used both as a pure breed, for upgrading of unimproved cattle and for crossbreeding with European breeds. Sahiwal has made important contributions to most of the new breeds of Zebu x temperate cattle.

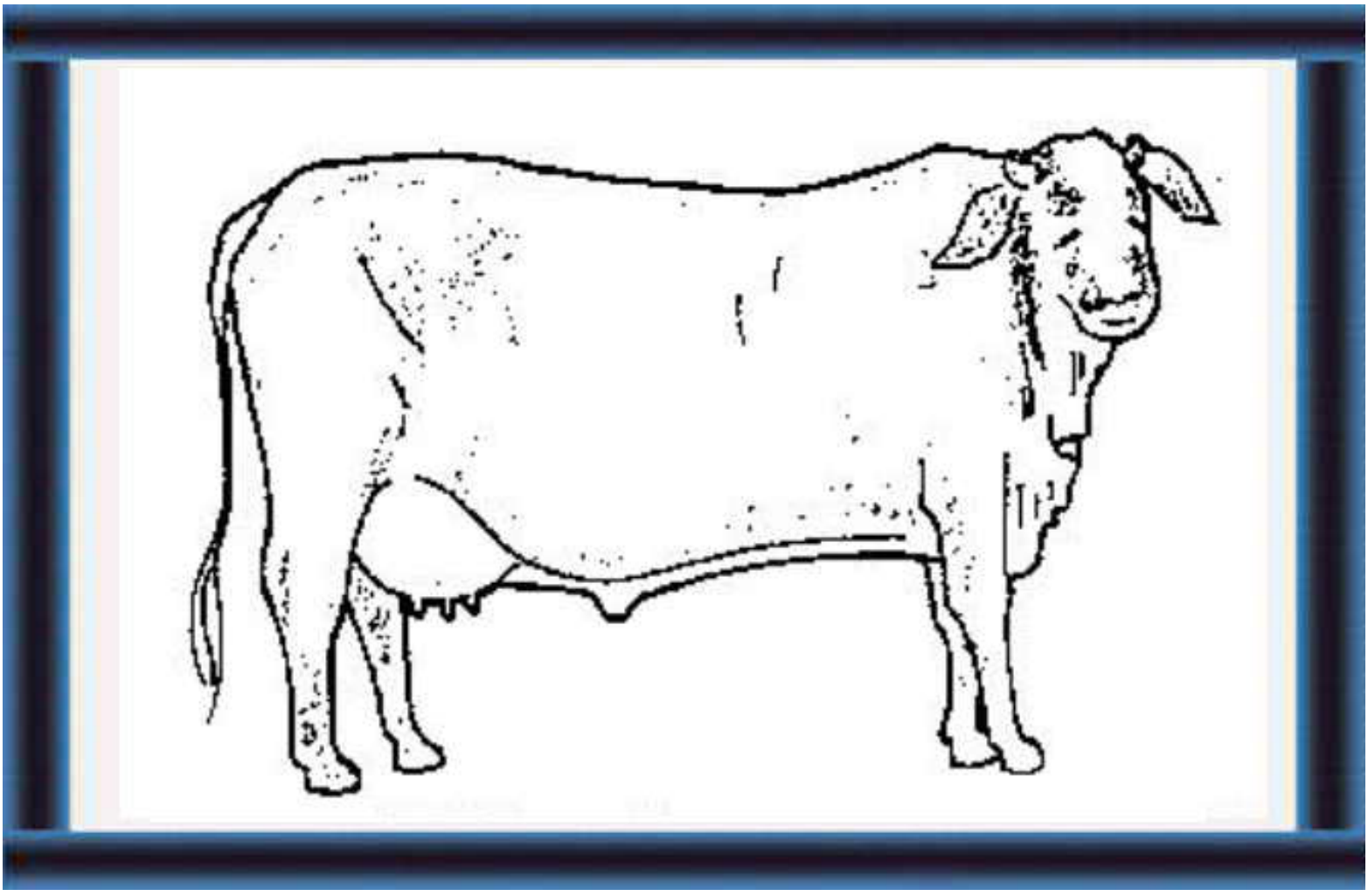
Location : Pakistan, India, Africa
Colour : greyish-red or brown
Meat production : poor average good
Draft ability : poor average good
Values for breeding : 1. upgrading native cattle
2. cross breeding with European breeds

19 **Male**



Average body weight (kg): 300 400 500 600 700

20 **Female**

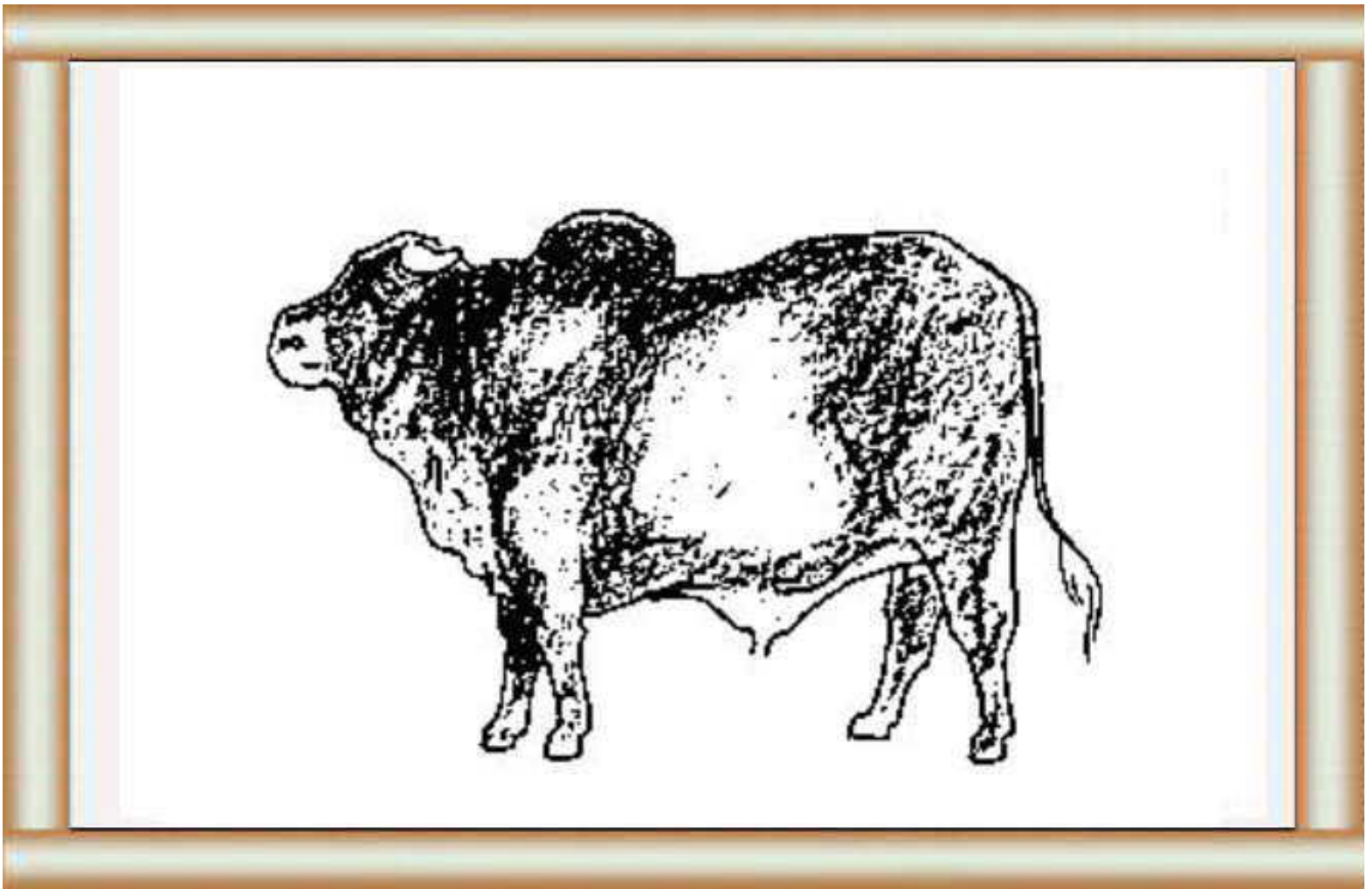


Average:

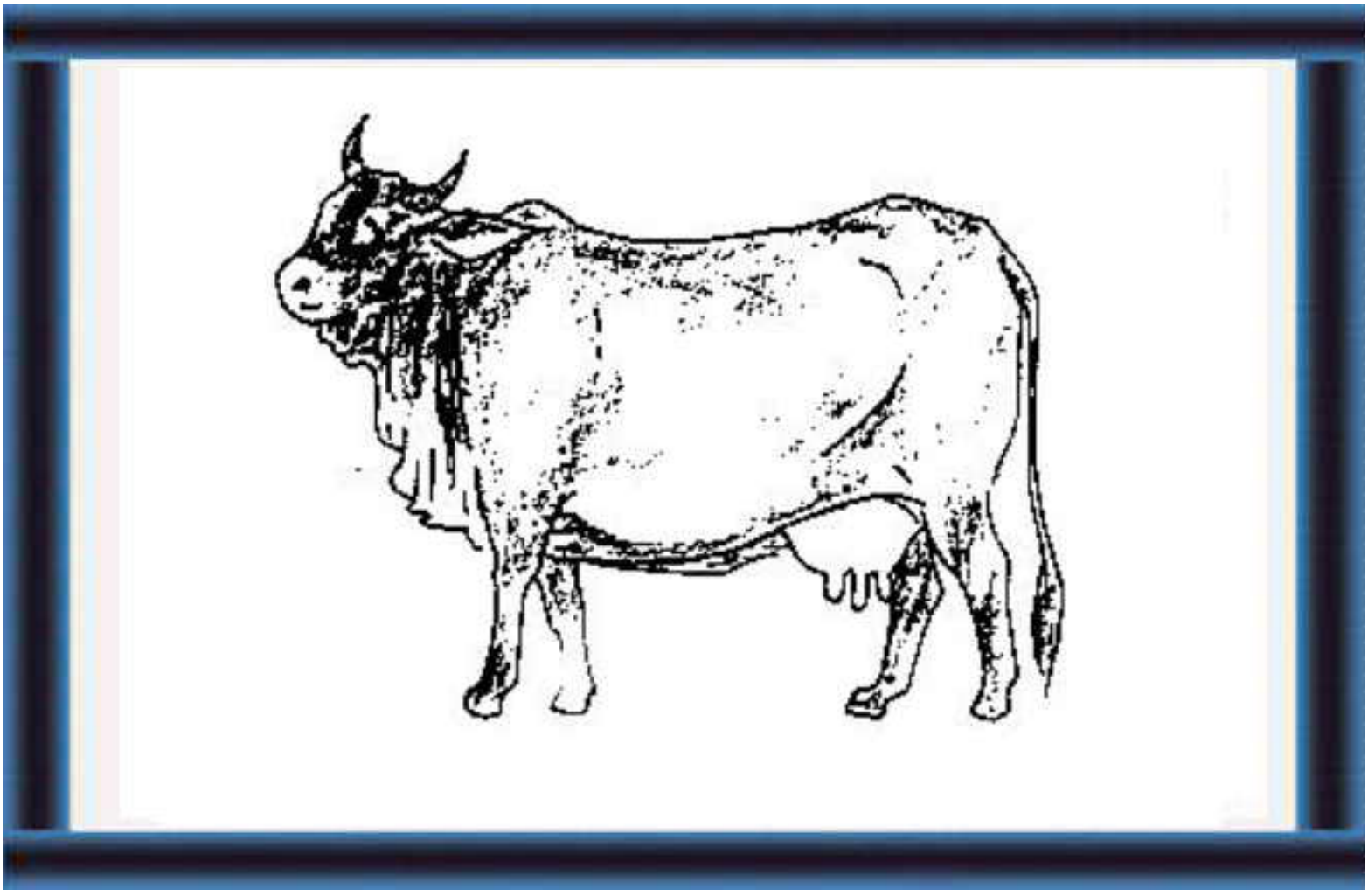
Body weight (kg)	**:300**	**400**	**500**	**600**	**700**
Lactation period (days)	**:250**	**275**	**300**	**325**	**350**
Milk yield/lactation (l)	**:1,000**	**2,000**	**3,000**	**4,000**	**5,000**
Fat content (%)	**: 3%**	**4%**	**5%**	**6 %**	
Solids-not-fat content (%)	**: 8-9 %**				

Two other Zebu breeds are used to a limited extent:
Red Sindhi

21 Male

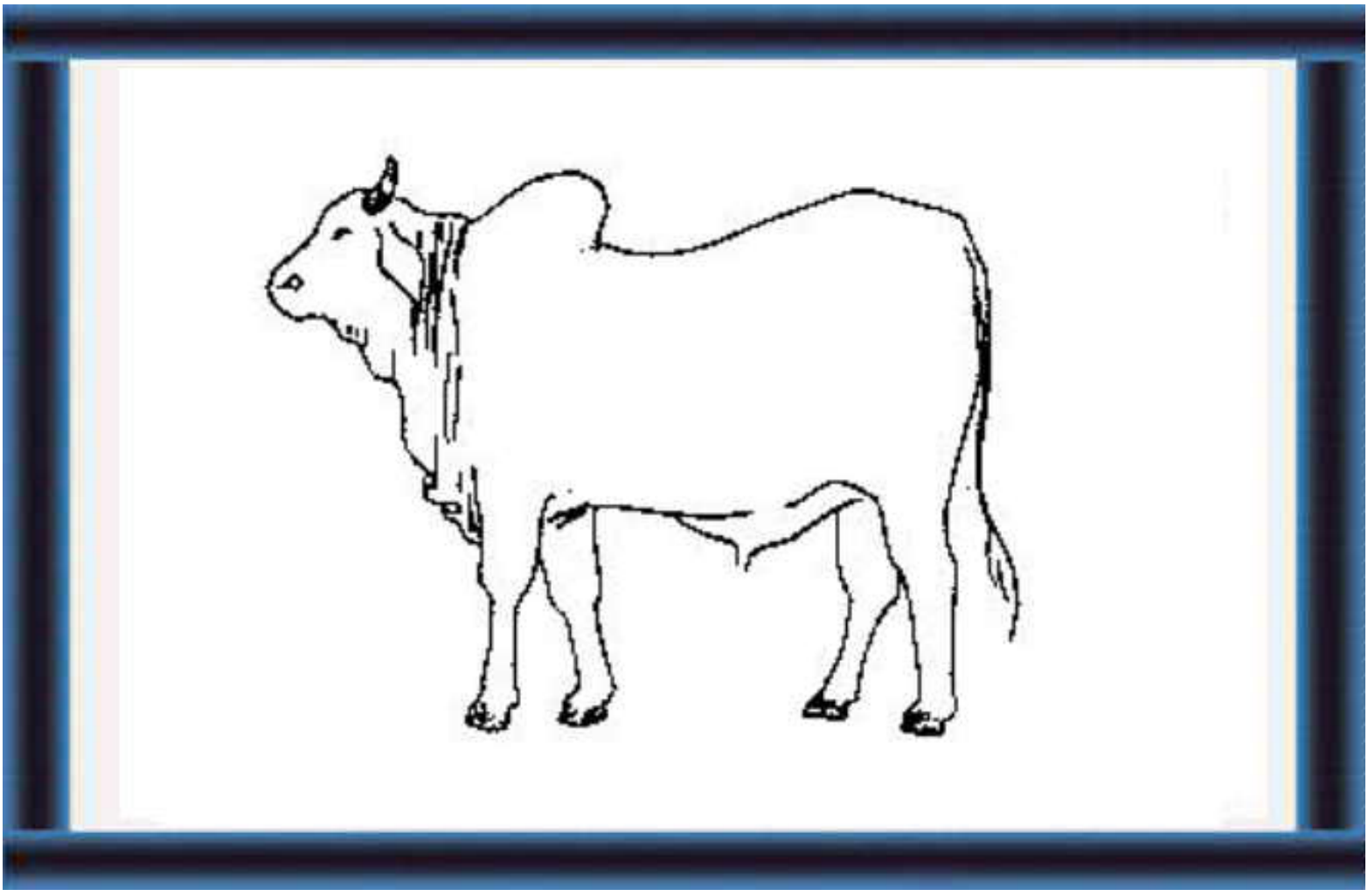


22 Female

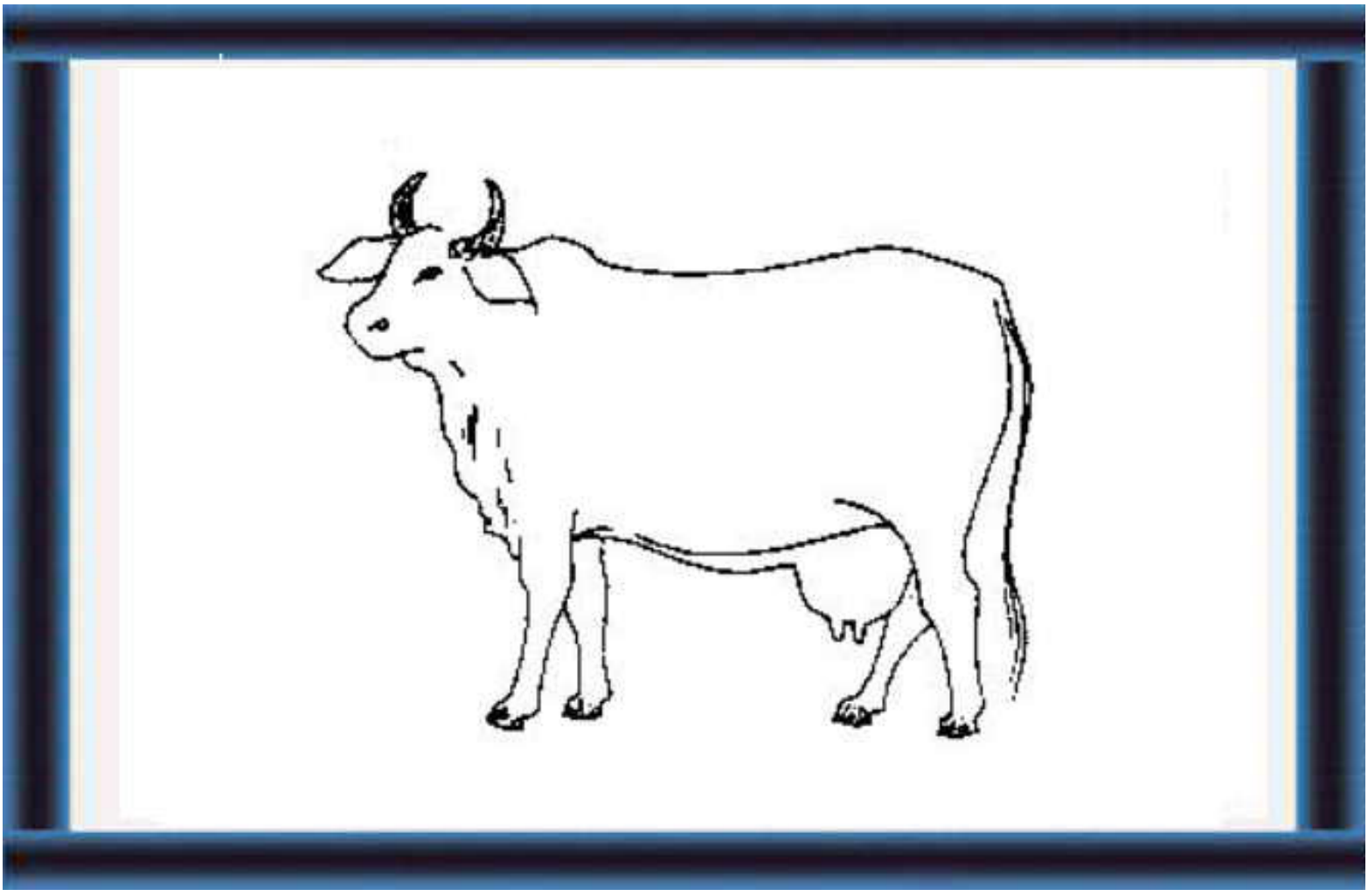


Tharparkar

23 Male



24 Female



Hariana breed (25-26)

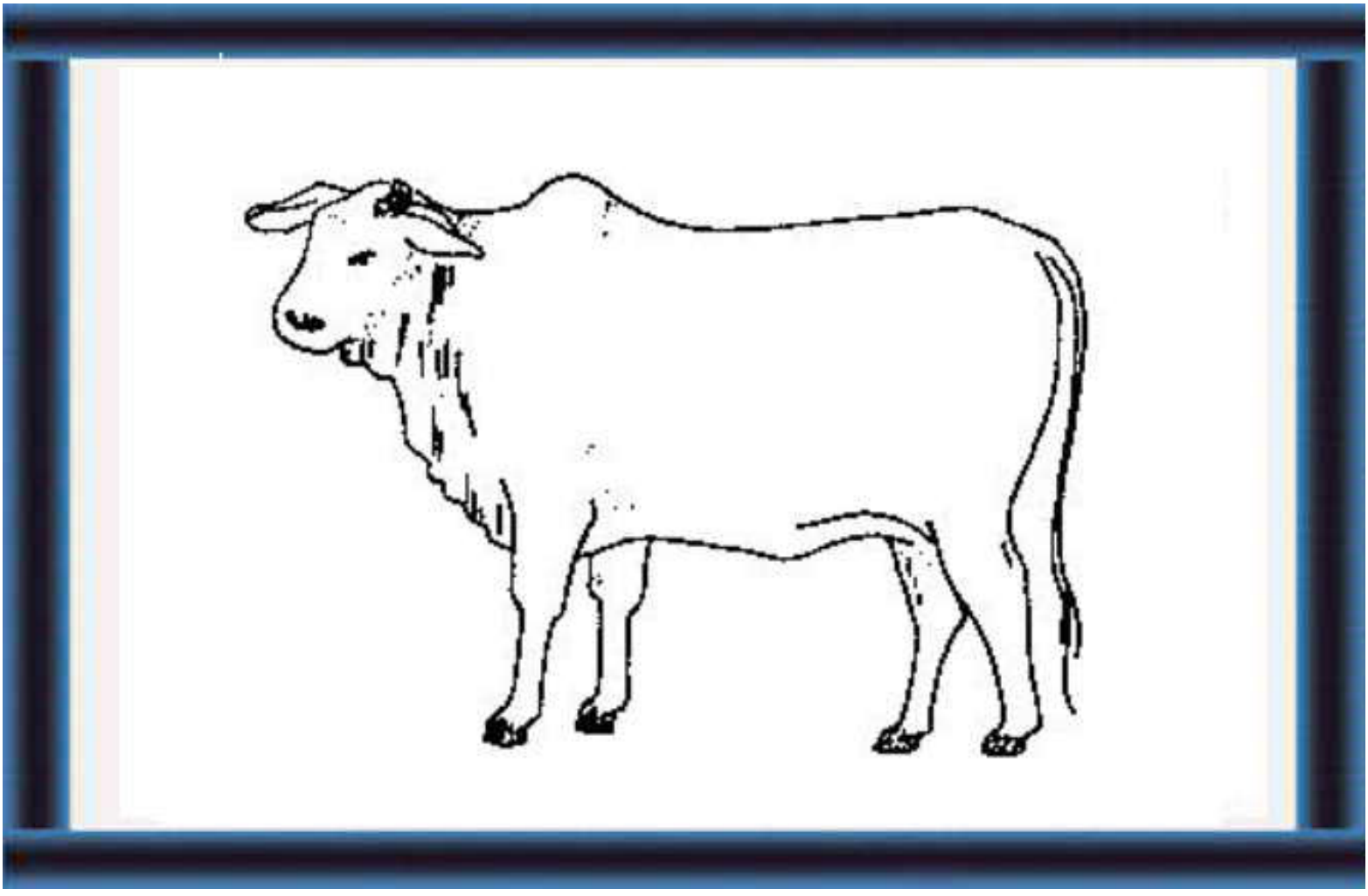
This is the most common breed in North India. It is a prominent dual purpose breed (milk and draught). The bullock is highly recognized for its vigour and persistency for draught. Cows produce about 1,000 kg of milk per lactation. Hariana has been the local counterpart in many crossbreeding programmes.

Kankrej, Gir and Ongole breeds

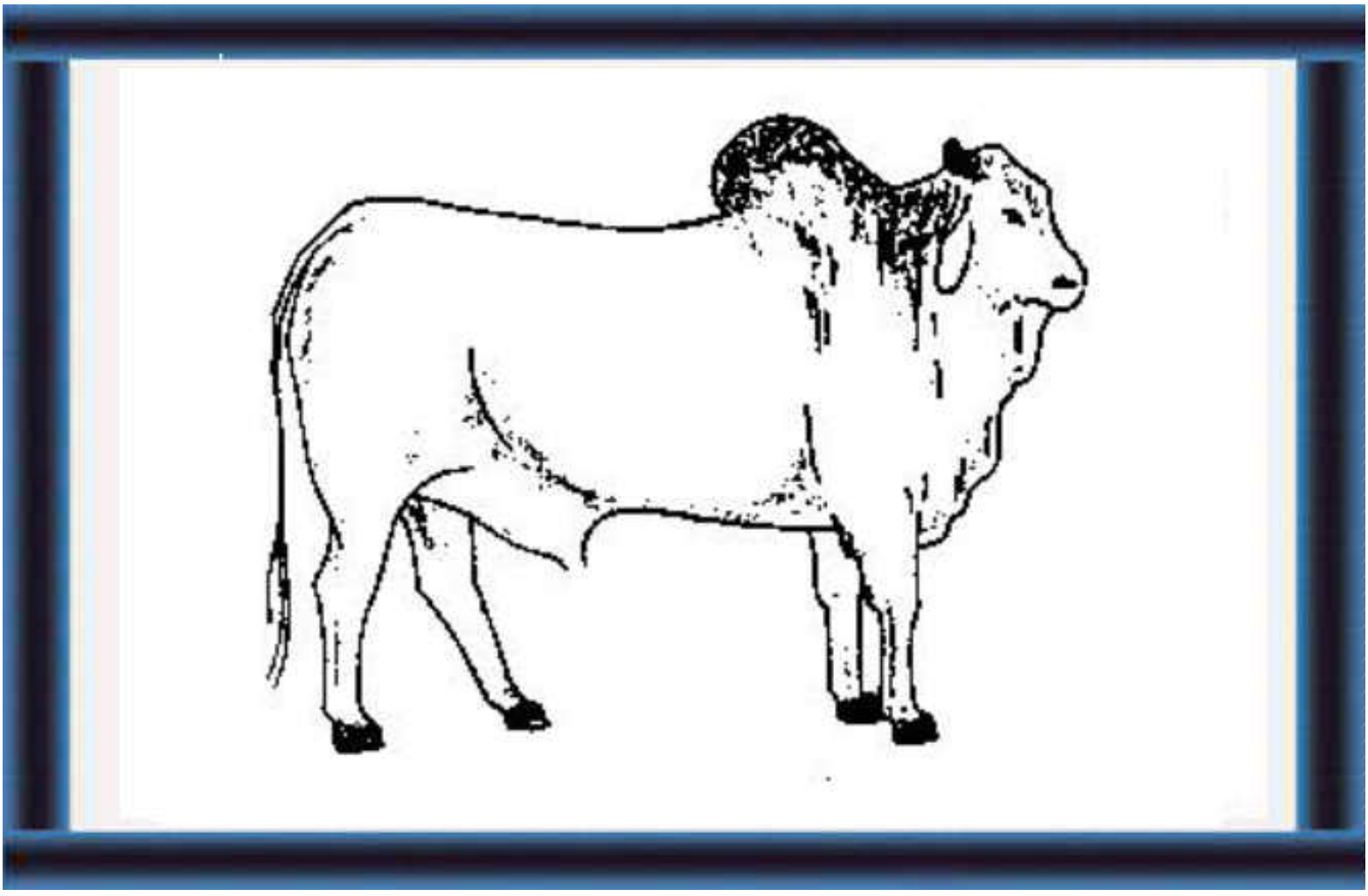
These are three breeds from the Western and Southern parts of India. They combine very good draught ability with acceptable milk yields. They also have a high potential for meat production.

Other Zebu breeds include:
Hariana

25 Male



26 Female
The bullock is a strong draught animal.



Kankrej, Gir and Ongole breeds are good for draught and meat production and have acceptable milk production.

Bos Taurus group

For over two centuries, the temperate breeds of cattle have been subjected to strong selection pressure for improved dairy, beef or dual purpose (dairy and beef) characteristics. Many of these breeds have been used in crossbreeding in the tropical countries. Some of the more important ones are as follows.

Holstein Friesian breed (also called Friesian, Holstein or Black and White) (27-28)

This breed has a characteristic Black and White colour and is the predominant breed in most developed countries. There are about 70

million Holstein Friesian type cows in the world accounting for about one-third of all dairy cows.

The breed is well known for its high milk yields (with averages of over 6,000 kg per lactation in several countries), but fat and solids-not-fat contents are low. They also have larger weight gains and higher mature weights than other temperate breeds of dairy or dual purpose cattle.

In recent years, Friesians have gained in popularity as the temperate counterpart for crossbreeding of Zebu cattle and in some countries, this is the breed of choice.

Brown Swiss breed (29-30)

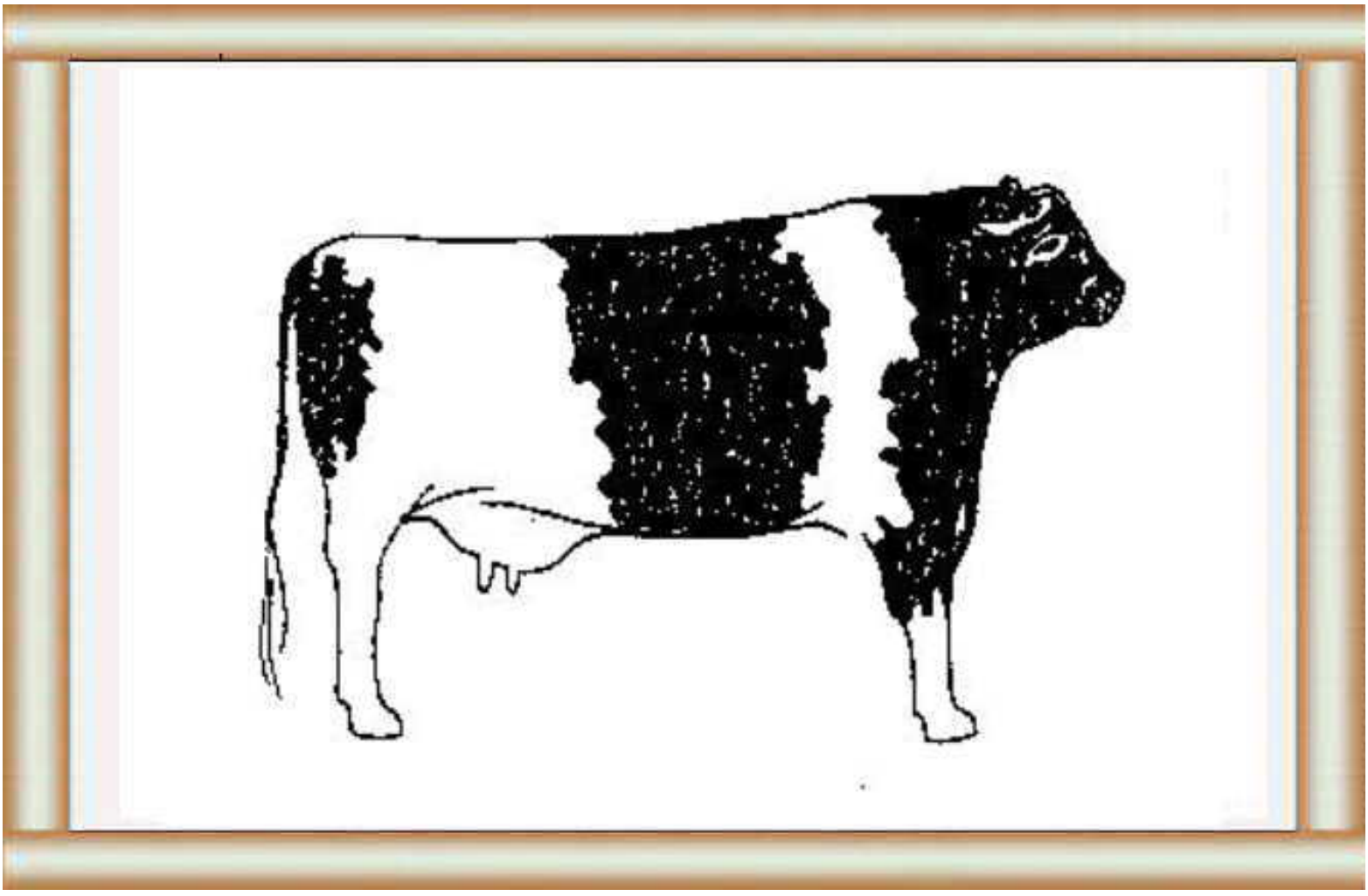
This breed has a somewhat lower lactation yield than Holstein, but with a higher fat content. It is slightly better than Holstein in beef potential.

The total world population is in the range of about 4 million cows (2 percent of all dairy cows).

European or temperate (Bos taurus)
Holstein Friesian (Black and White)

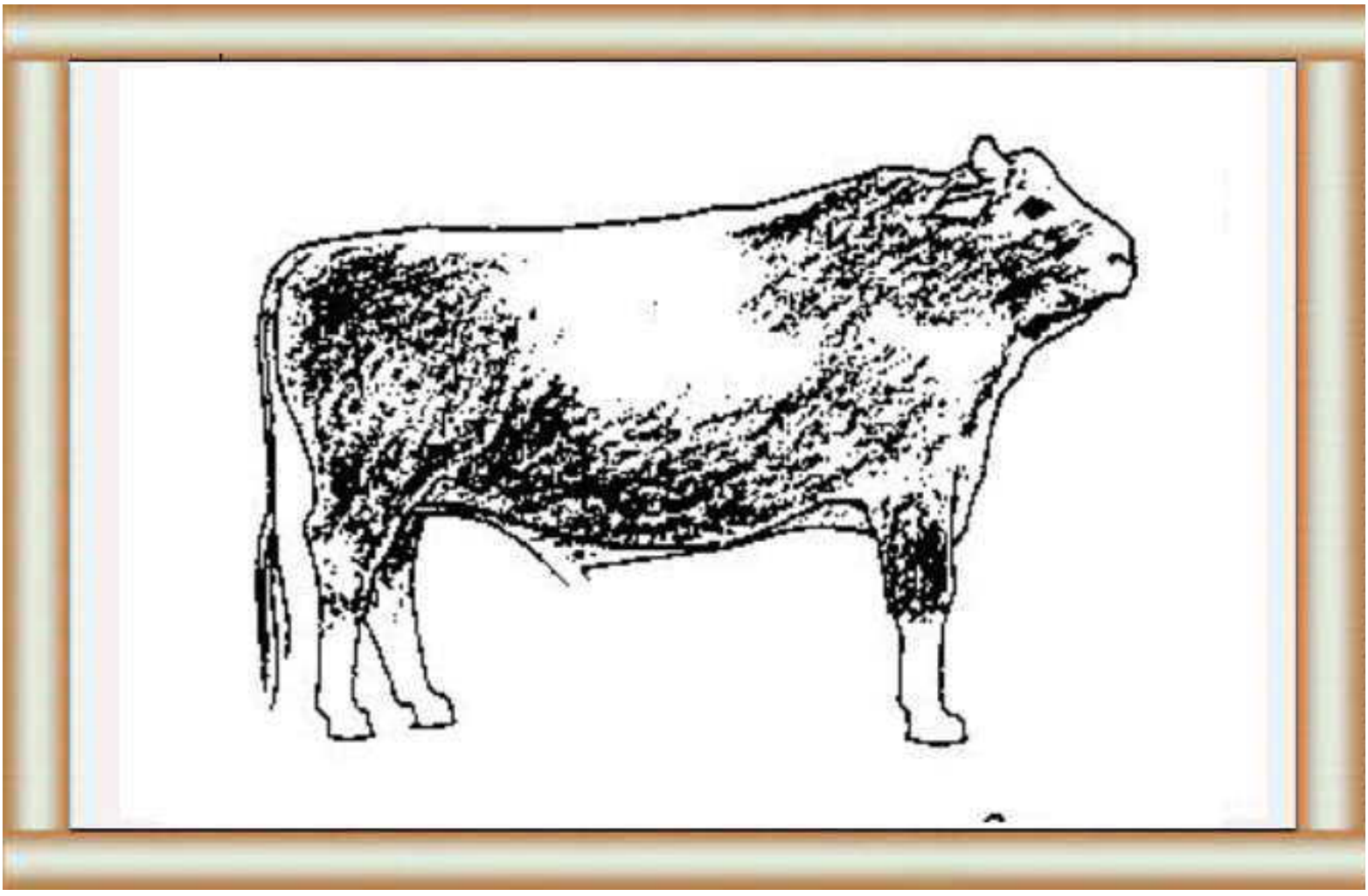
27 Male
This breed is the most popular for cross-breeding with Zebu and gives high meat and milk production over 6,000 kg/ lactation in several countries.

28 Female

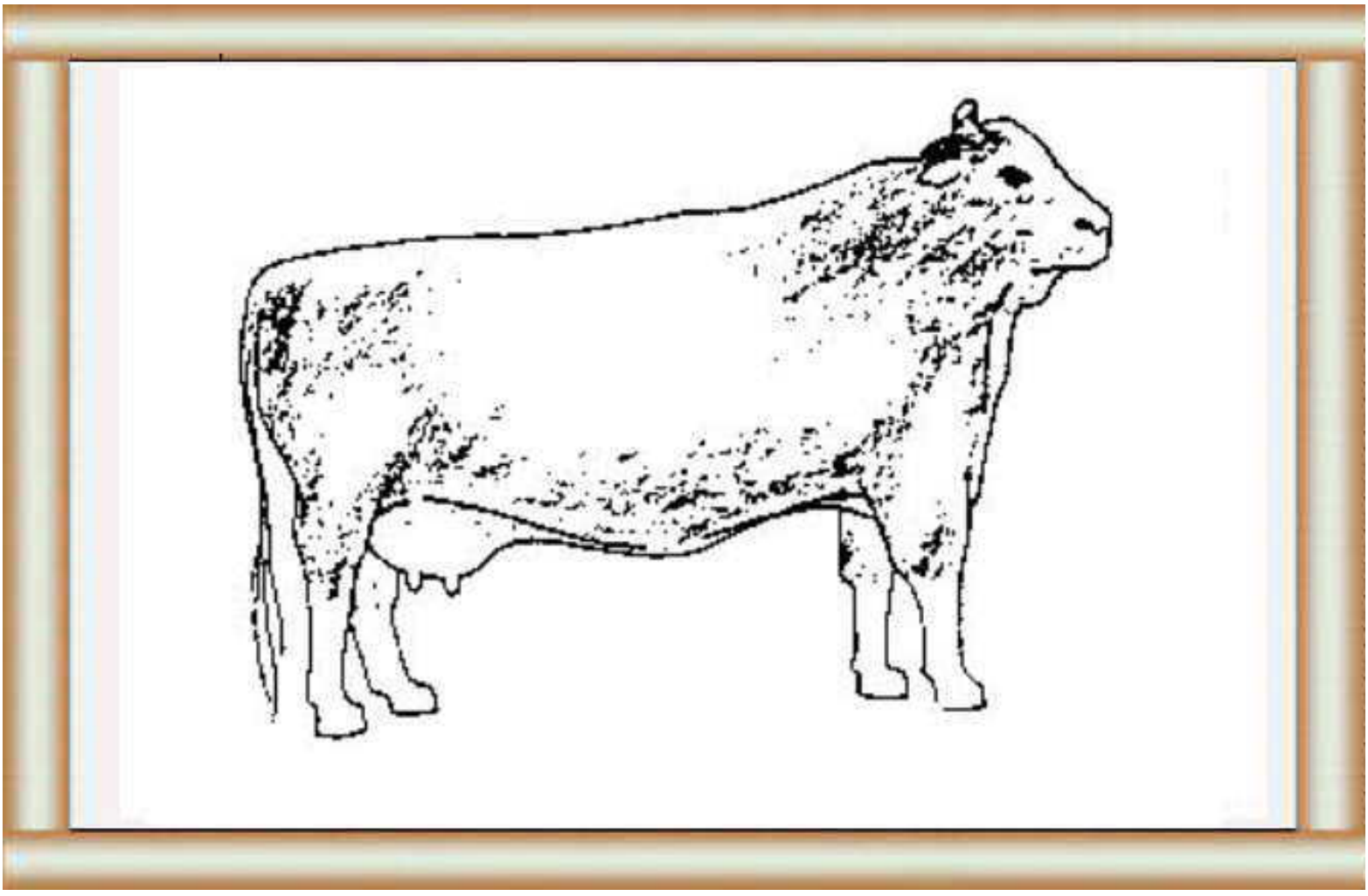


Brown Swiss

29 Male
This breed has:
(1) lower milk yield/lactation
(2) higher fat content
(3) better beef production than the Friesian.



30 Female



Jersey breed (31-32)

This breed is characterized by its fawn colour, small mature body size (mature body weight is about 60 % of the Friesian), early sexual maturity, high butter fat levels and poor beef capacity.

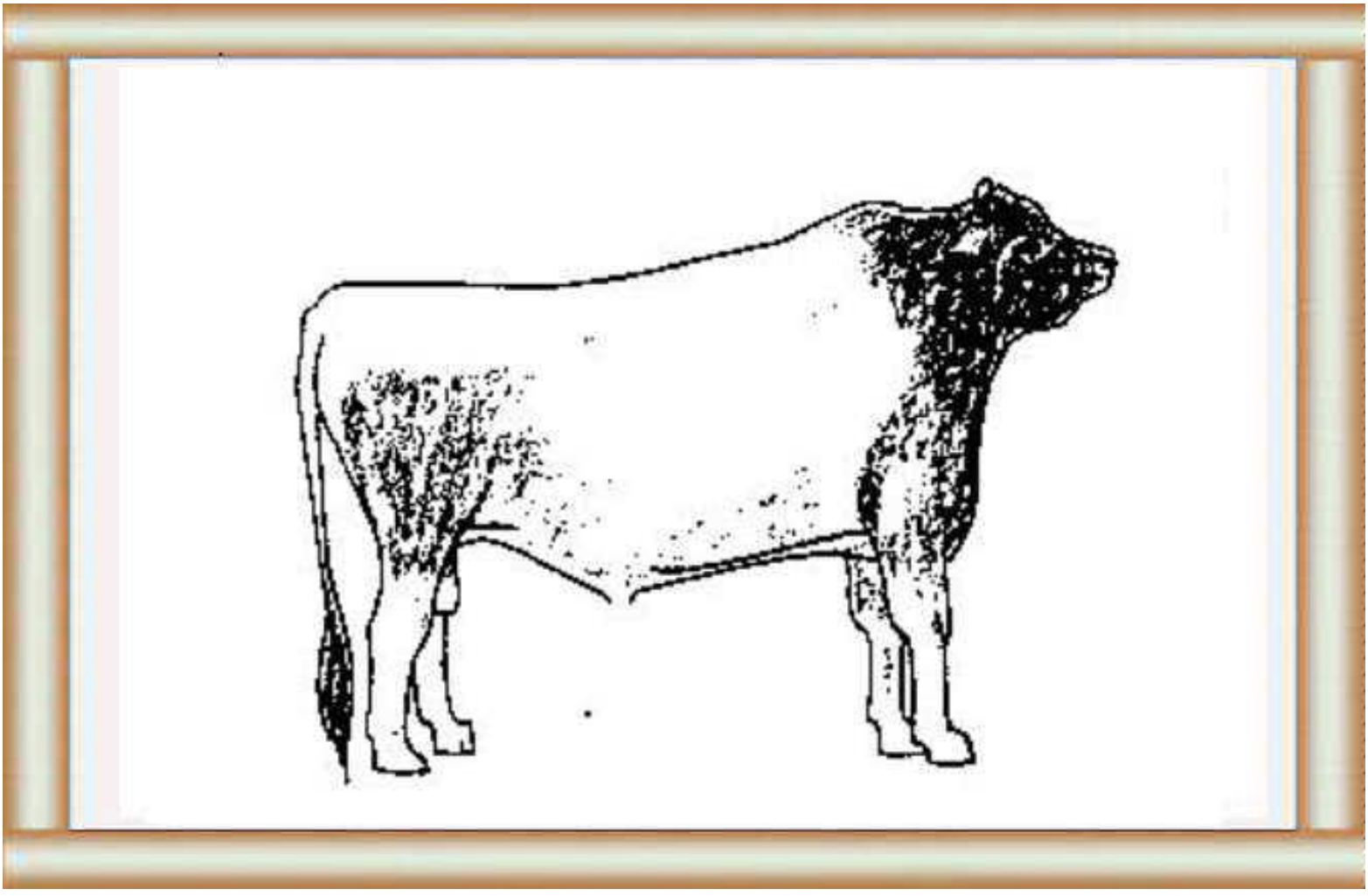
The total number of Jersey cows in the world has been estimated to be about 2 million (1 % of all dairy cows).

Other breeds

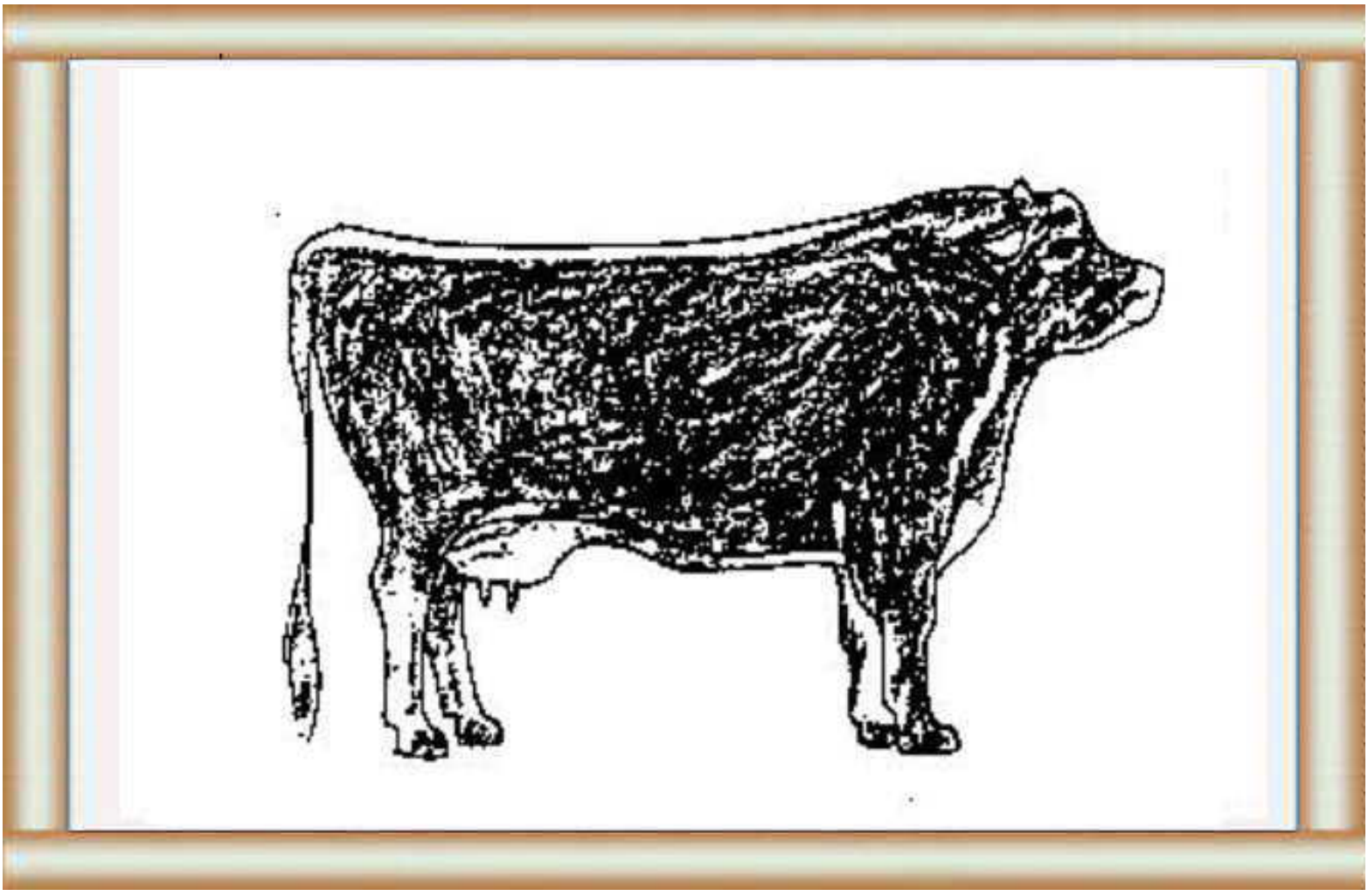
Other temperate breeds such as Dairy Shorthorn, Ayrshire, Red Dane, Simmental, Normande, Guernsey and MRY have also been used in crossbreeding in the tropics but to a limited extent.

Jersey

31 Male
This breed has:(1) lower milk yield/lactation (2) higher fat content
(3) earlier sexual maturity (4)poorer beef capacity than the Friesian.



32 Female
Other temperate breeds include:(1) Dairy Shorthorn (2) Ayrshire (3) Red Dane (4) Simmental (5) Normande (6) Guernsey (7) MRY.



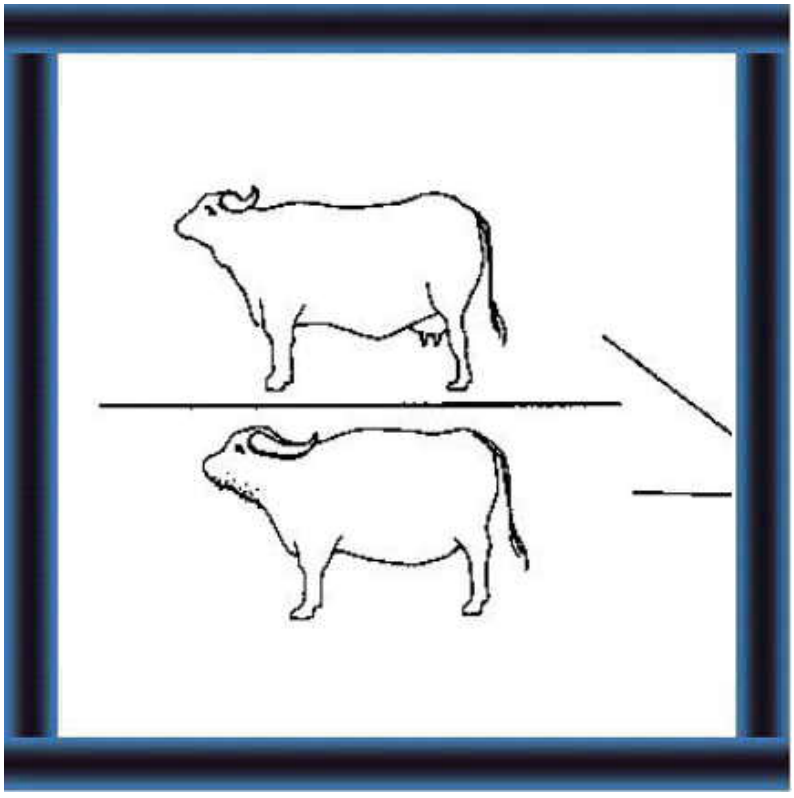
Dairy Buffalo breeds (33-36)

Buffaloes are mainly concentrated in Asia. Two main types are identified: River Buffalo and Swamp Buffalo.

The buffaloes in India and Pakistan belong to the River type. They have been selected for improved milk production. They are also good meat producers and can be used for work as well.

The native buffaloes in other countries in the region belong to the Swamp type. They are used primarily for work and meat. Milk yields are very low. However, in several countries even these low yields contribute to the income of the rural poor.

What are the major types of dairy buffalo?

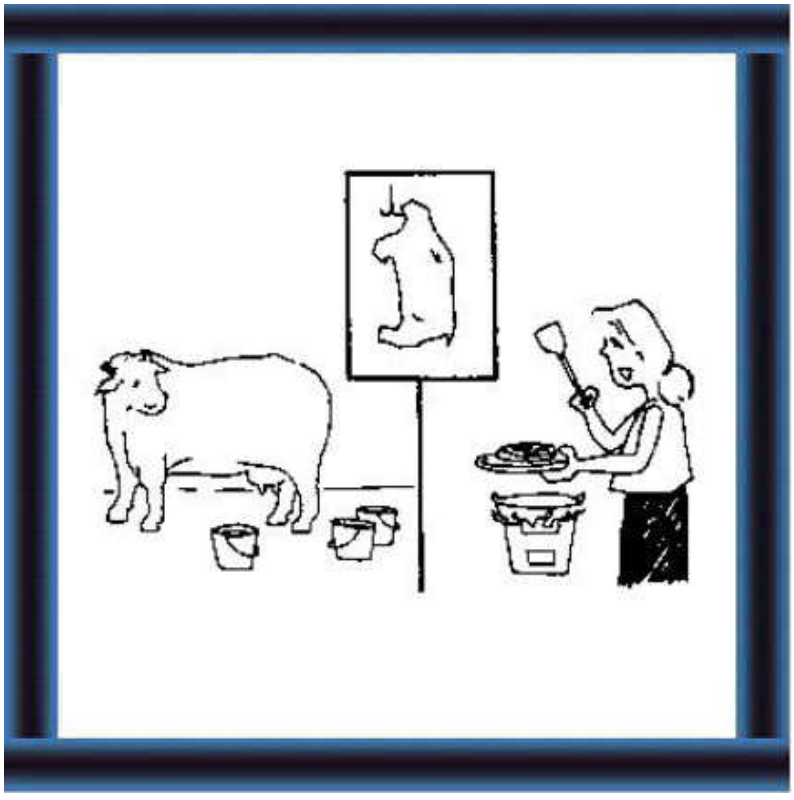


33 There are two major types:

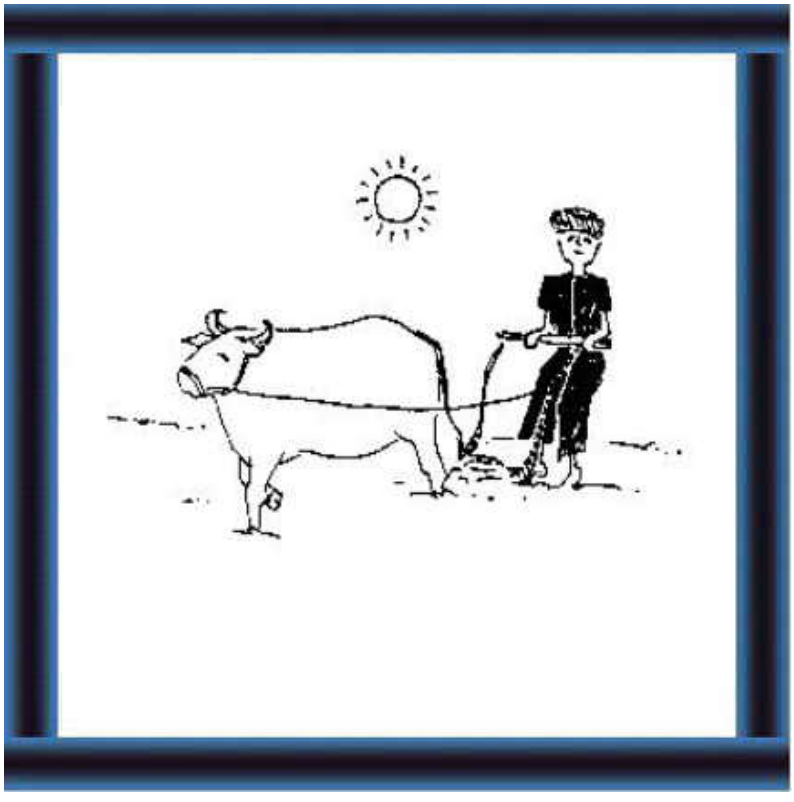
- **River buffalo**
- **Swamp buffalo**.

River Buffalo

34 Most buffaloes in India and Pakistan are River buffalo.



35 They have good:
- milk production
- meat production



36 and are good for draught work.

River Buffalo

Murrah (37-38)

The name Murrah was given to the buffaloes having curled horns and producing good milk. The breed originated in Punjab and is found in India and Pakistan. Several other countries of the world have imported these animals.

The animals are heavy with a wide deep frame. The horns are short and tightly curled. The females have a fine clean-cut head and neck whereas the males have a thick neck. The limbs are short, straight and strong with black hooves. The tail is long with a white switch. The udder is well developed with squarely placed teats. The body colour is black but a few brown or fawn grey animals are also seen. The body weight on average is 550 kg for males and 450 kg for females. The milk yield per lactation (between 270 to 305 days) in good herds is 1,500-1,800 litres with 7 percent fat.

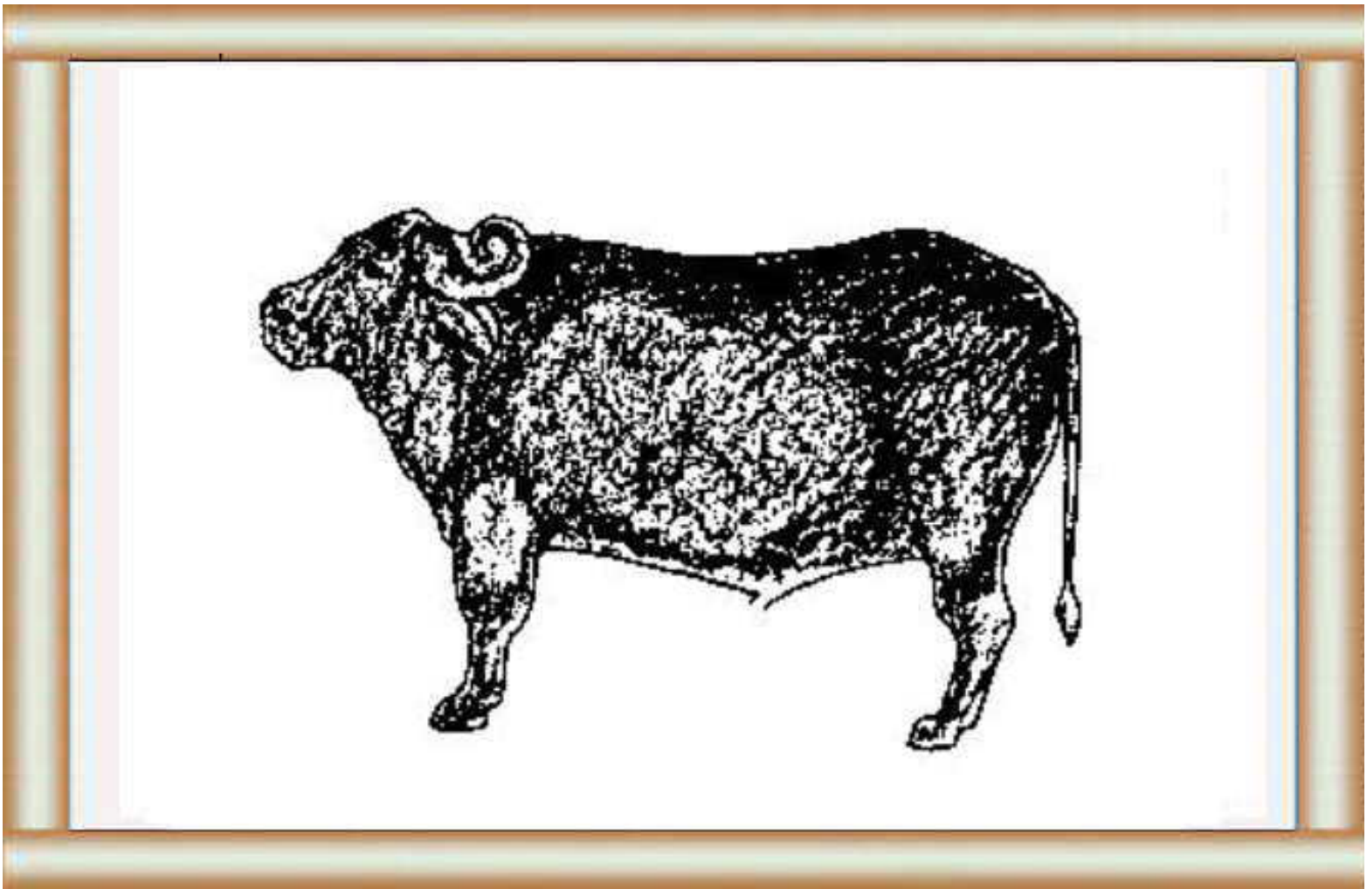
Nili Ravi (39-40)

The Nili Ravi breed is found in Punjab. Previously these were described as two breeds - Nili is found in Sutlej valley (Punjab) and Ravi in Sandal Bar. Both areas are the central Punjab Pakistan. The animals are black coloured, wall eyed, with white head markings. The hooves and switch of tail are white. The body is massive. The head is long and convex and the double chin is conspicuous. The udder is well developed with squarely placed long teats. The milk veins are very prominent.

The average weight of male and female is 600 and 450 kg respectively. Milk production ranges between 1,800-2,000 litres in 250-300 days.

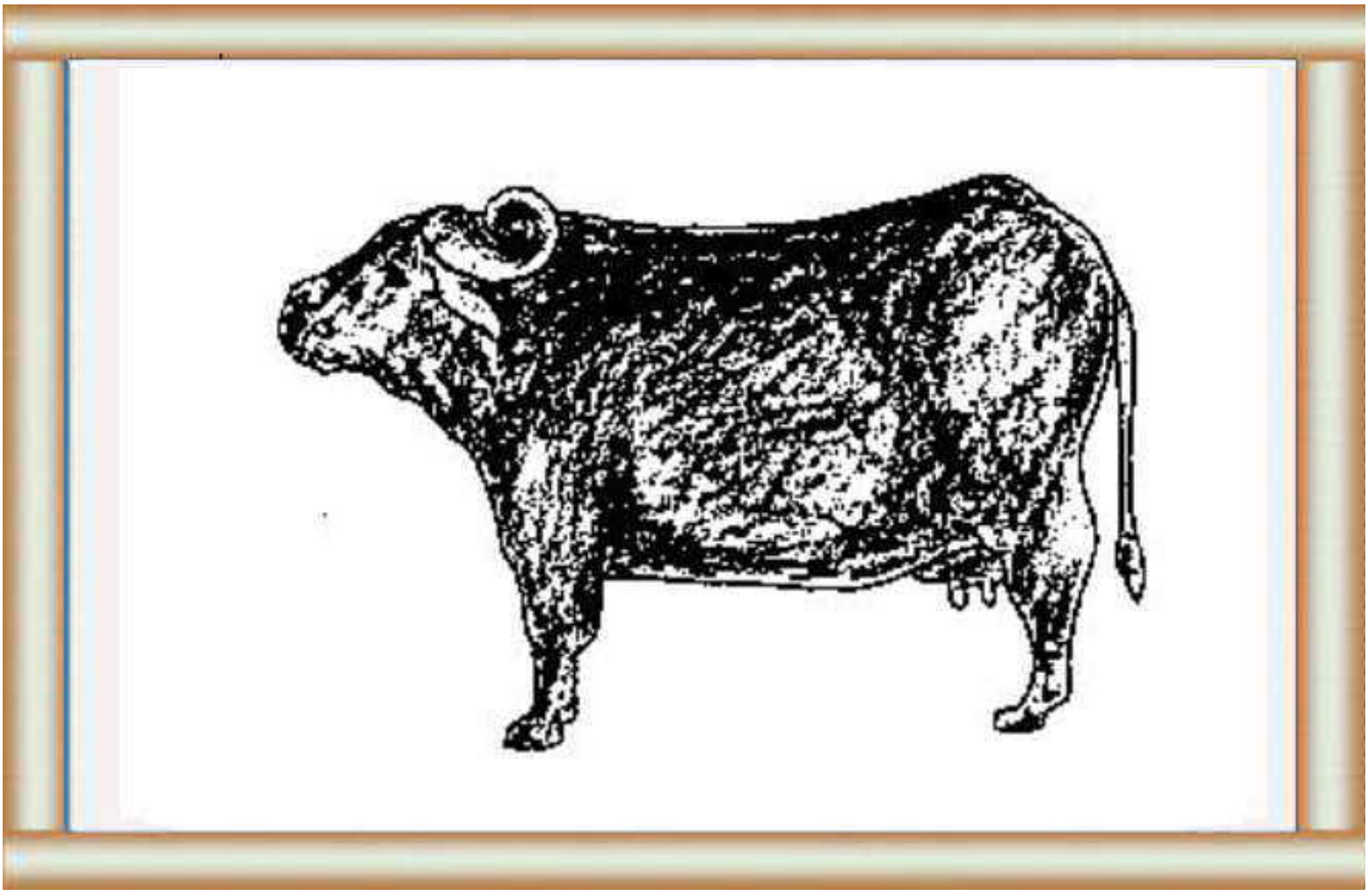
The major River Buffalo breeds are:
Murrah

37 Male



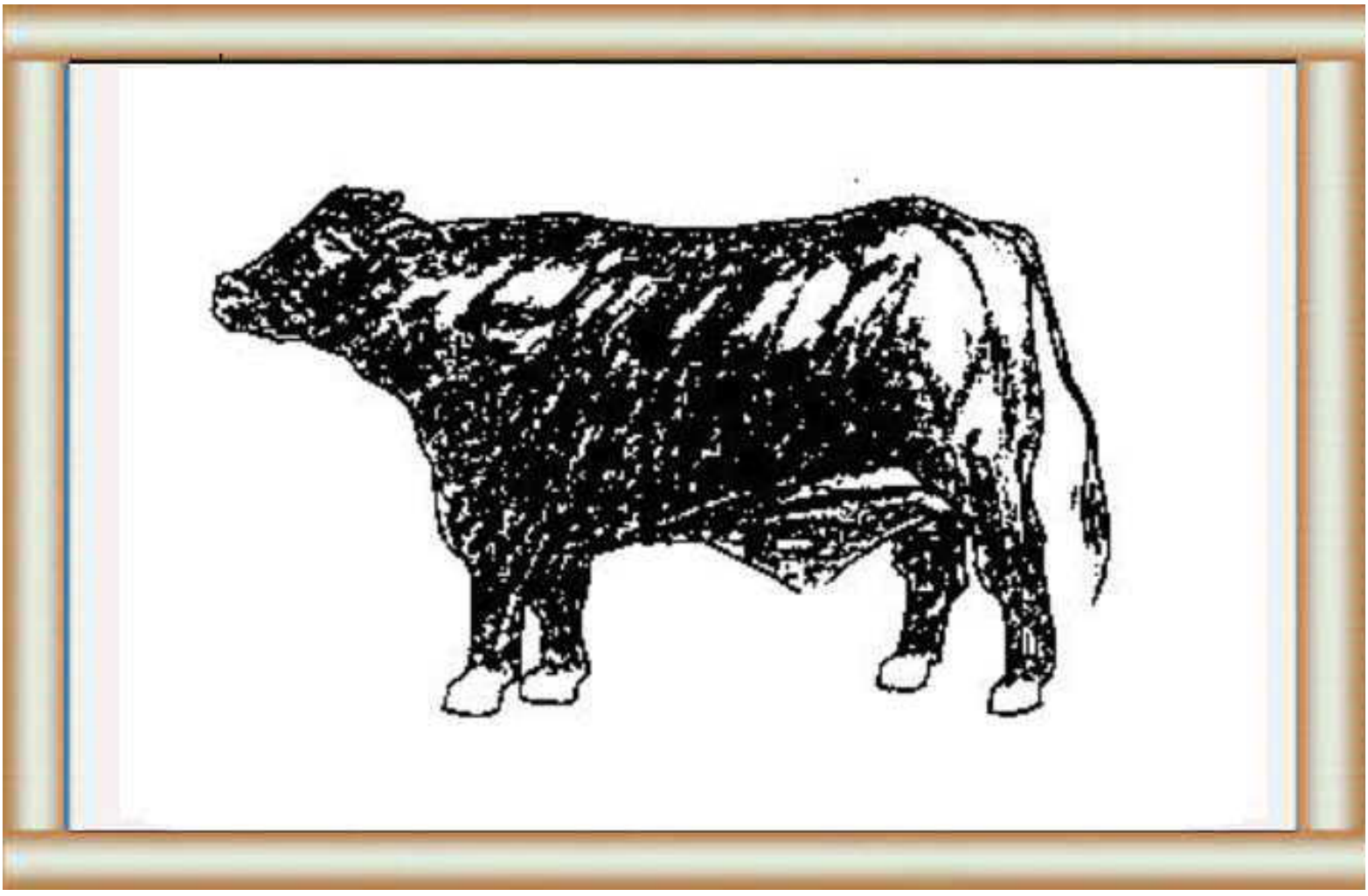
38 Female

The milk yield/lactation is 1,500-1,800 l with 7 % fat.

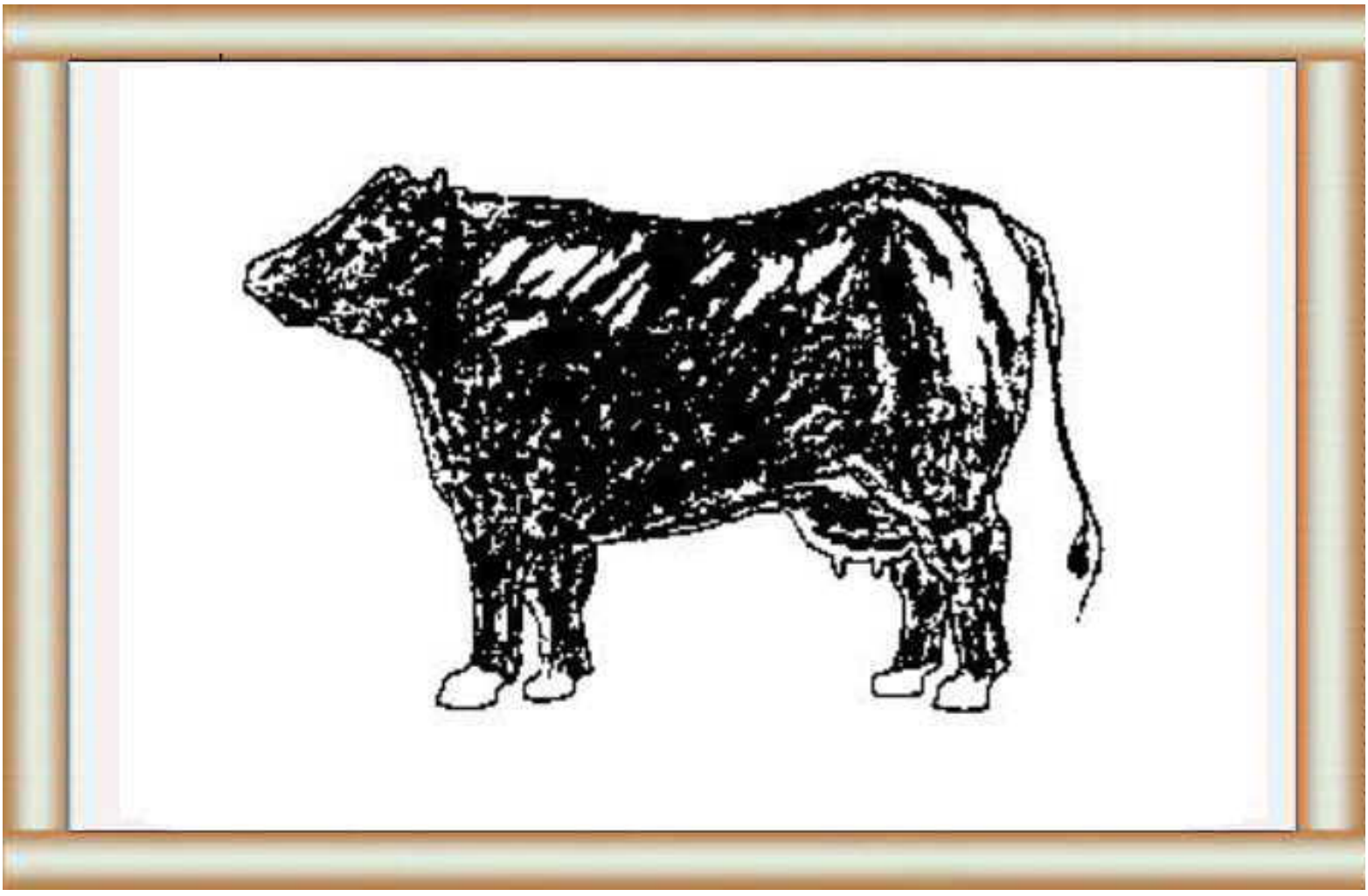


Nili Ravi

39 Male



40 Female
The milk yield/lactation is 1,800-2,000 l.



Kundi (41-42)

This breed is found in Sind Province of Pakistan around the River Indus. The animal is jet black in colour. Sometimes there is a white star on the forehead and the hooves may be white. The horns are thick at the base inclined backward and upward and end in a tight curl (the name Kundi coming from horns). The udder is well developed with squarely placed teats and the hind quarters are massive.

Animals of this breed are smaller than the Nili Ravi buffaloes and have a liveweight of 320 - 450 kg.

Milk yield varies between 1,500-2,000 litres with 7 percent butter fat.

Surti (43-44)

The Surti breed is found in Gujarat State of India. The colour is black but brown animals are also found. The tuft of the tail is white. The horns are of medium length and sickle shaped. They are flat with transverse corrugations and are hook shaped. The animals have a very straight back and are low on the legs. The head is long and fairly broad and the eyes are very prominent. The neck is long and thin in females but massive in males and there is no dewlap.

The udder is well shaped and the teats are medium sized. The skin of the udder is pinkish in colour. The female has an average weight of 600 kg and the male about 700 kg.

Milk production is around 1,500-1,750 litres with 8 percent butter fat.

Kundi

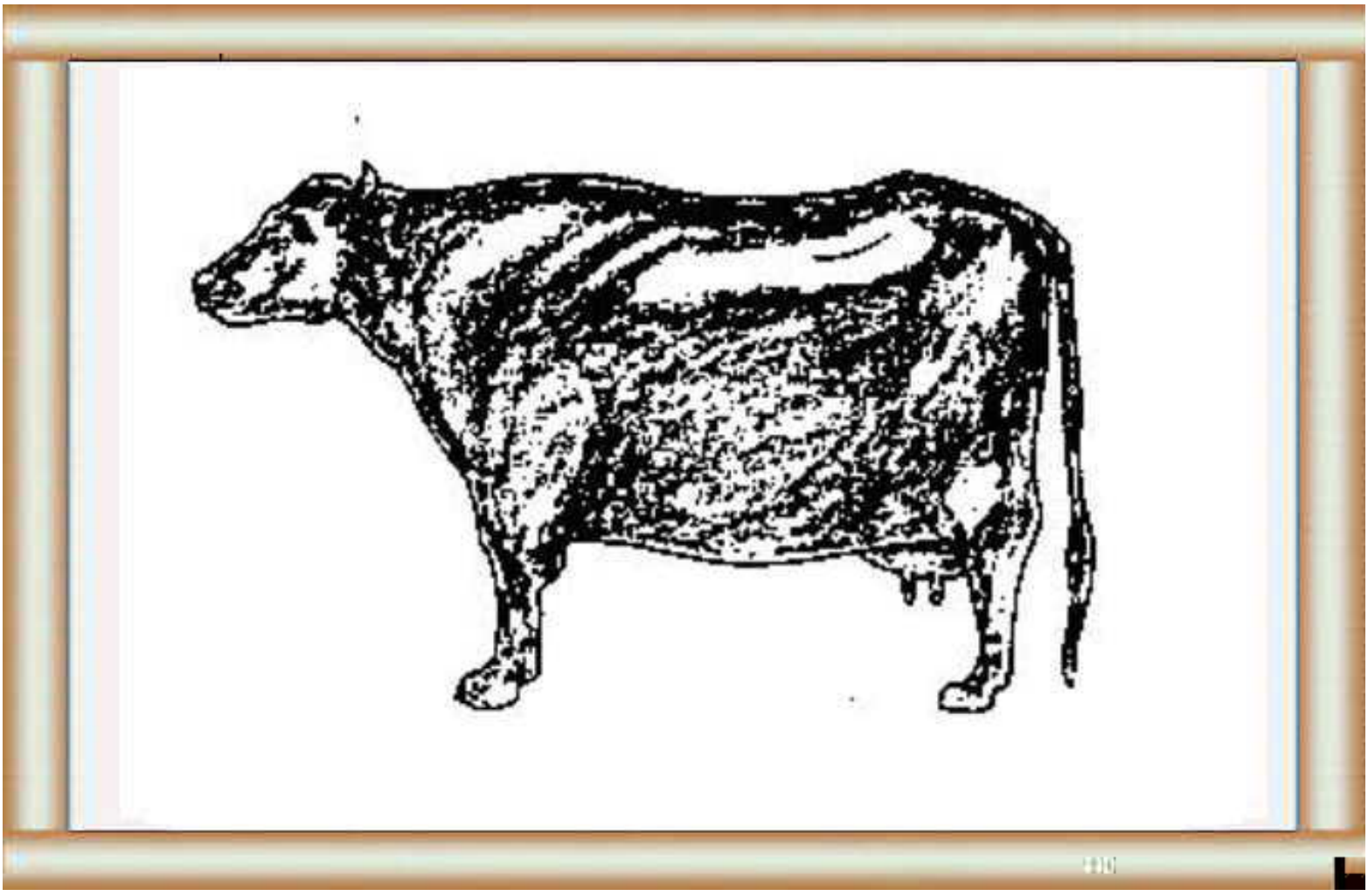
41 Male

42 Female
The milk yield is 1,500-2,000 l with 7 % fat.

Surti

43 Male

44 Female
The milk yield is 1,500-1,750 l with 8 % fat.



Mehsana

The breed's hometract is Gujarat and parts of Maharashtra States (India). The breed is a cross between Murrah and Surti. The colour is jet black. The horns are coiled (like Murrah) or sickle shaped (like Surti). The animals have a long body, higher limbs and a longer and heavier head. Females have a well developed udder. The teats are fairly thick, long and pliable. Mehsana females are reputed for regular breeding and persistent milking.

The body weight of males and females is 600 and 425 kg respectively. Milk production ranges between 1,300-1,800 litres in a lactation of 300 days.

Jafarahadi/Zafarahadi, Nagpuri, Bhadawari and Taria breeds

These are four of the several breeds with localized importance in India.

Jafarahadi buffaloes are found mainly in Gujarat. They are good milk producers but poor breeders.

The other three breeds are lower milk producers but are good draught animals

with good adaptation to the conditions in their local areas.

Swamp Buffalo (45-46)

The name Swamp buffalo arises from their natural habitat in swamp areas. In certain regions the wild herds also move with domesticated buffaloes. Various regional names are also given. (Carabao - Philippines; Kwai Tui or Kwai Jaam, Kwai Kam etc. in Thailand) The skin is grey but with advancing age turning to slate blue. Dark grey colour giving a white tinge is common. The horns grow out laterally and horizontally in young animals and curve round in a semi-circle in older ones. In Thailand the horn shape and size varies from short horns to long straight horns.

The animals are well built. The body is short with a pot belly. The forehead is flat, orbits are prominent and the face is short. The neck is long and the legs are short and thin. The tail is short reaching the hocks. The udder is small and set far back in the legs. The weight in small types is between 300-450 kg but in larger types 450-550 kg.

The Swamp buffalo is a work animal of rice growing areas. The main use is ploughing, harrowing and puddling of rice fields. It is also used for carts and sledges and has tremendous ability for draught. Milk yield is very low (maximum of around 488 litres) and generally it is not used as a dairy animal.

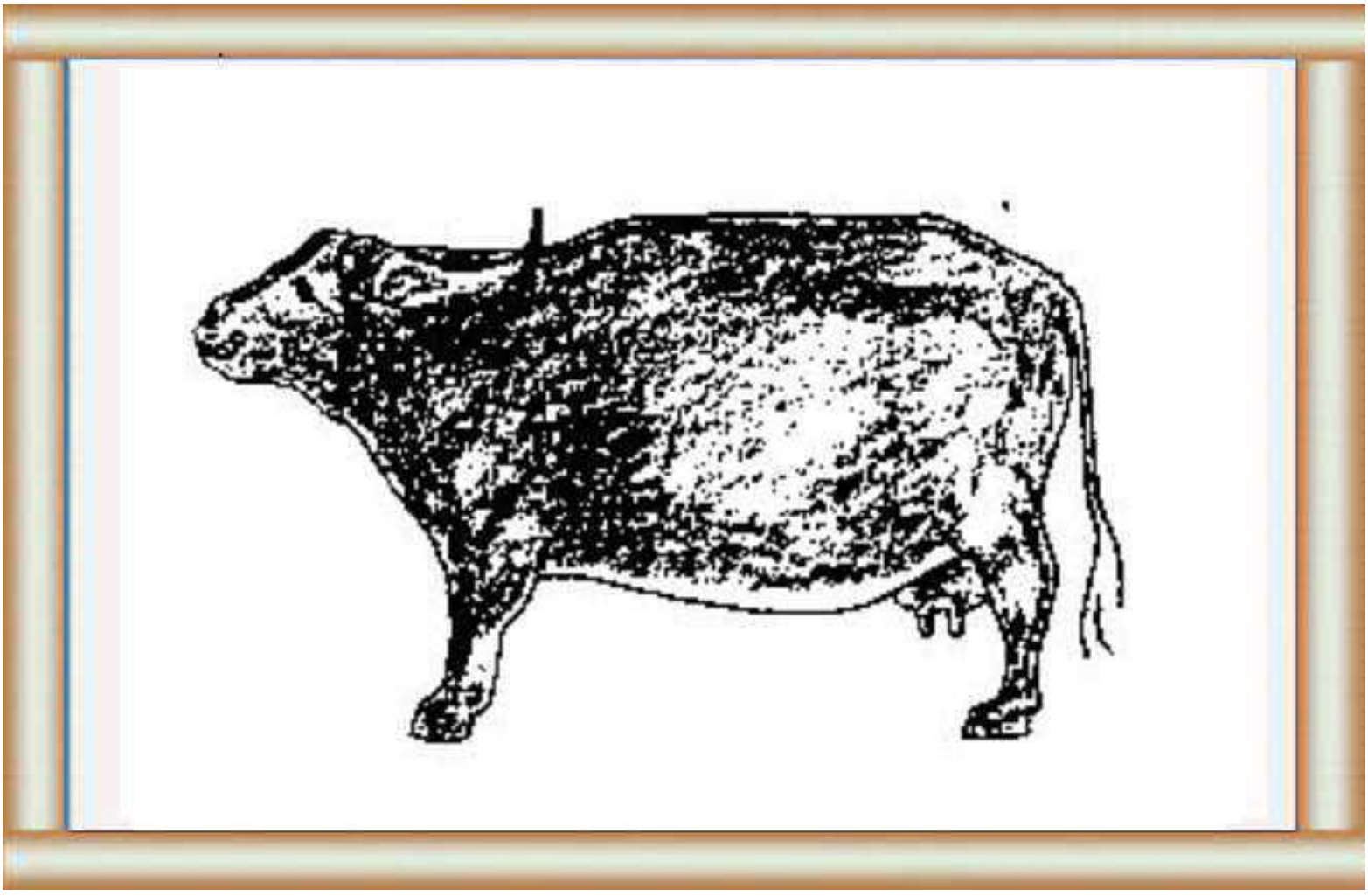
Animals like swamp areas. The hottest part of the day is spent in wallows and active grazing is in the morning and evening hours.

Other River buffalo breeds include:
Mehsana Jafarahadi / Zafarahadi
Nagpuri Bhadawari
Taria.

Swamp Buffalo

45 Male

46 Female



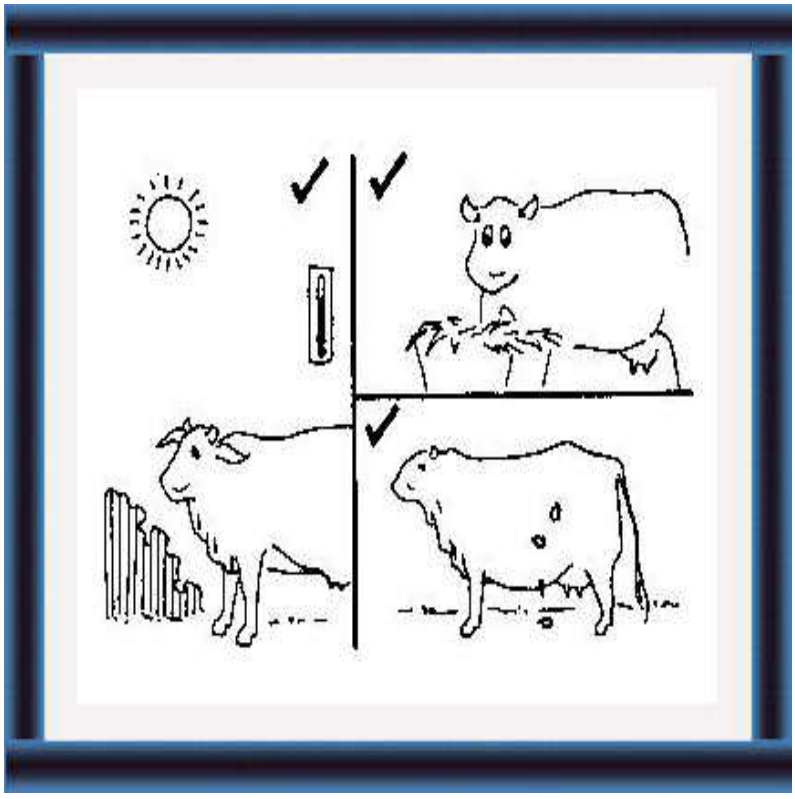
The Swamp buffalo is a good draught animal in rice growing areas.
The milk yield/lactation is less than 500 l.

Dairy cattle breeding

In their pursuit to produce suitable dairy cows, the different countries in the region are adopting various strategies.

The first attempts were aimed at importing pure bred temperate cattle and establishing them in the colder climates of especially the higher elevations. This practice met with little success because of the poor adaptability of the temperate cattle to the tropical conditions, even though some nucleus herds were maintained to produce pure bred stock, especially bulls and semen, for crossbreeding the local stock. (49-52)

What is the purpose of breeding dairy cattle and buffalo and how can you do it?

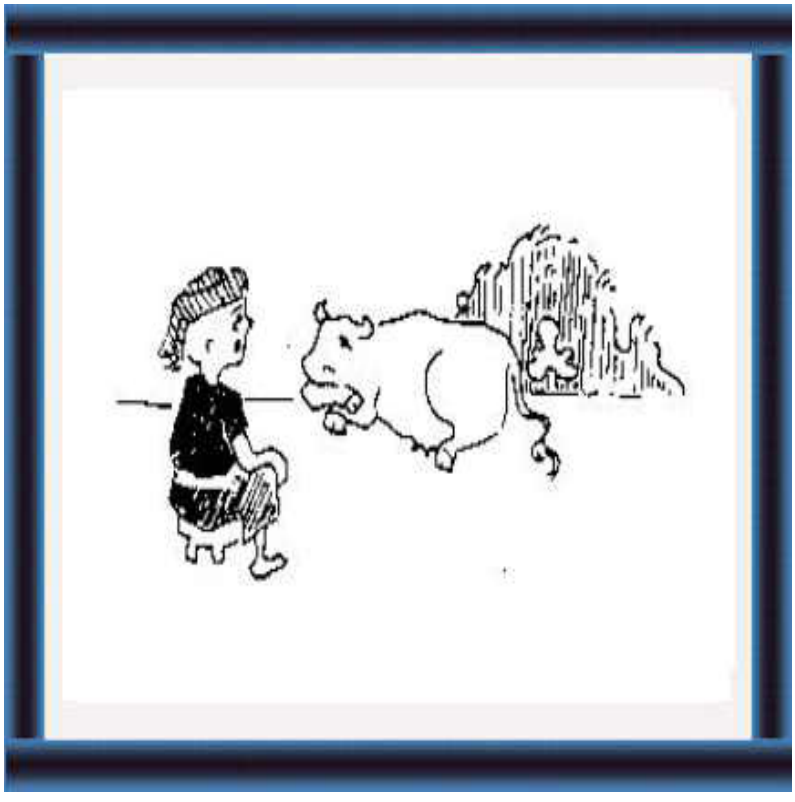


47 The purpose is to breed dairy cattle and buffalo which can **live happily** in local conditions

48 and still have **good**:
- milk production
- meat production
- draught ability, where they are used for draught.

Dairy cattle breeding

49 Some farmers kept pure bred temperate cattle in cool places, especially in the hills,



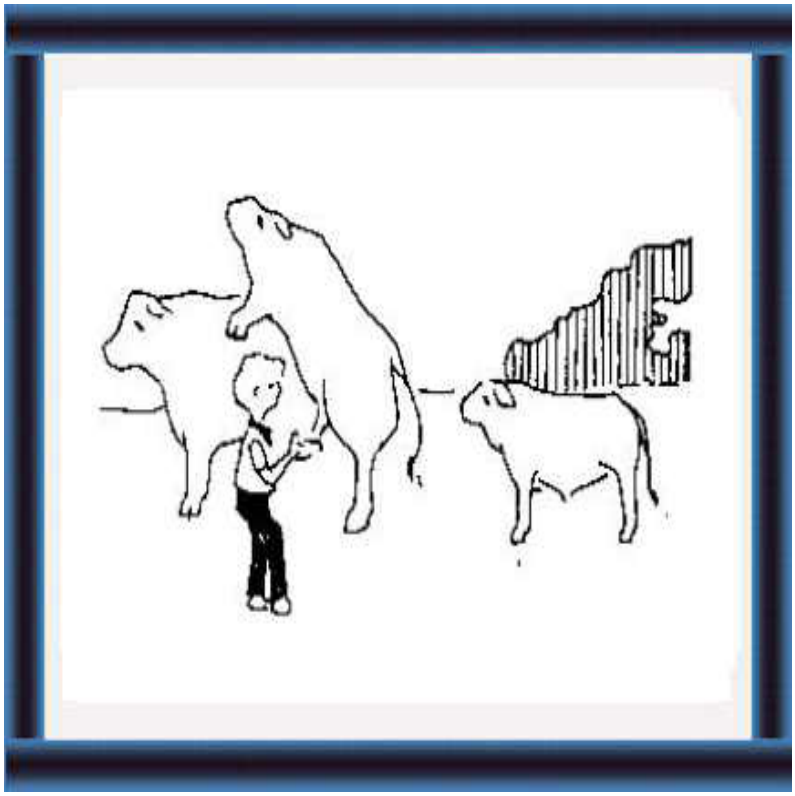
50 but most of the temperate cattle could not live happily in local conditions.

There are advantages in retaining some genes from the tropical breeds in the dairy cows to maintain their viability in the tropical climate. Crossbred cattle were produced, using different crossbreeding schemes. These schemes included

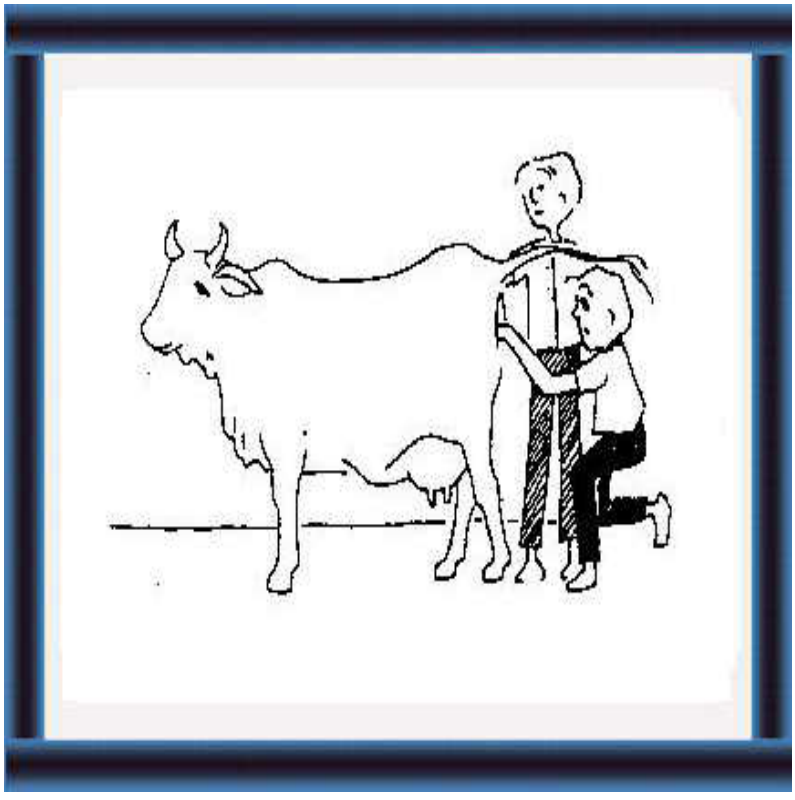
- rotational crossbreeding using several temperate breeds;
- production of synthetic breeds e.g. Jamaica Hope (approximately 80 % Jersey, 5 % Friesian and 15 % Sahiwal), Australian Milking Zebu - AMZ - (approximately 60 % Jersey and the balance 40 % mainly Sahiwal and a minor contribution from the Red Sindhi which was used at the initial stages of the programme) and Australian Friesian Sahiwal - AFS - (produced under a similar programme as the AMZ but with Friesian and Sahiwal breeds only).

Recently some countries have embarked on programmes to import pure bred temperate cattle, particularly Friesians, while others continue with the crossbreeding programmes. On the other hand, Sahiwal herds are also maintained pure and considerable improvements in yield characteristics are being achieved through selection within the breed. Sahiwal bulls are used to upgrade tropical cattle in some areas where it is not feasible to use cross-breeding with temperate breeds.

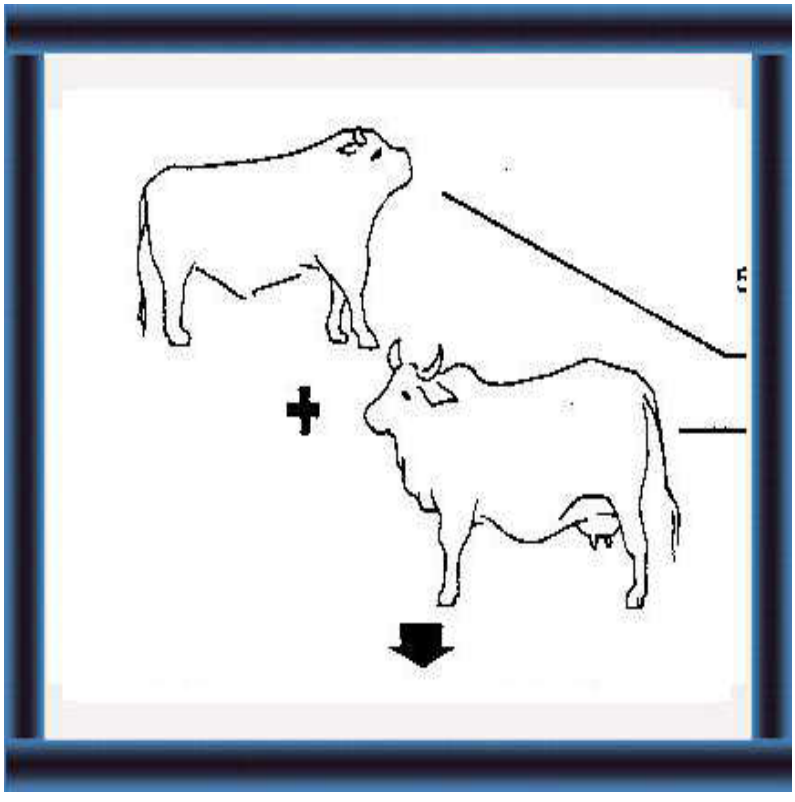
Considering the wide variety of strategies being adopted in the region, it is important that extension officers get a clear understanding of the strategies that are recommended for the particular area. Then only will they be in a position to assist the farmers to make correct decisions on breeding without making mistakes that may prove to be costly later on. (53-65)



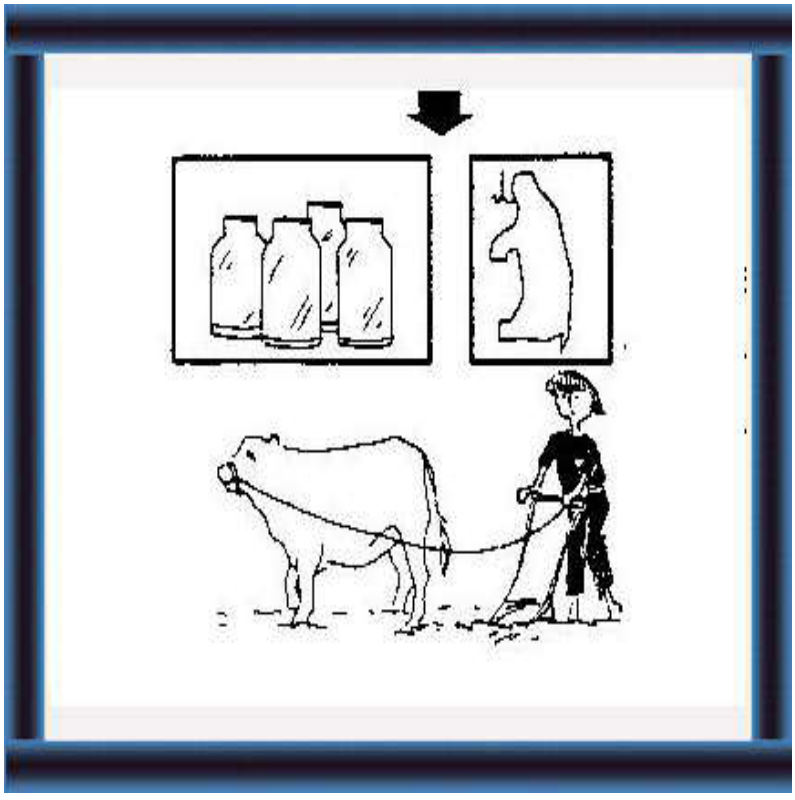
51 They set up some nucleus herds to produce pure bred stock, especially bulls and semen



52 for cross-breeding with local stock.



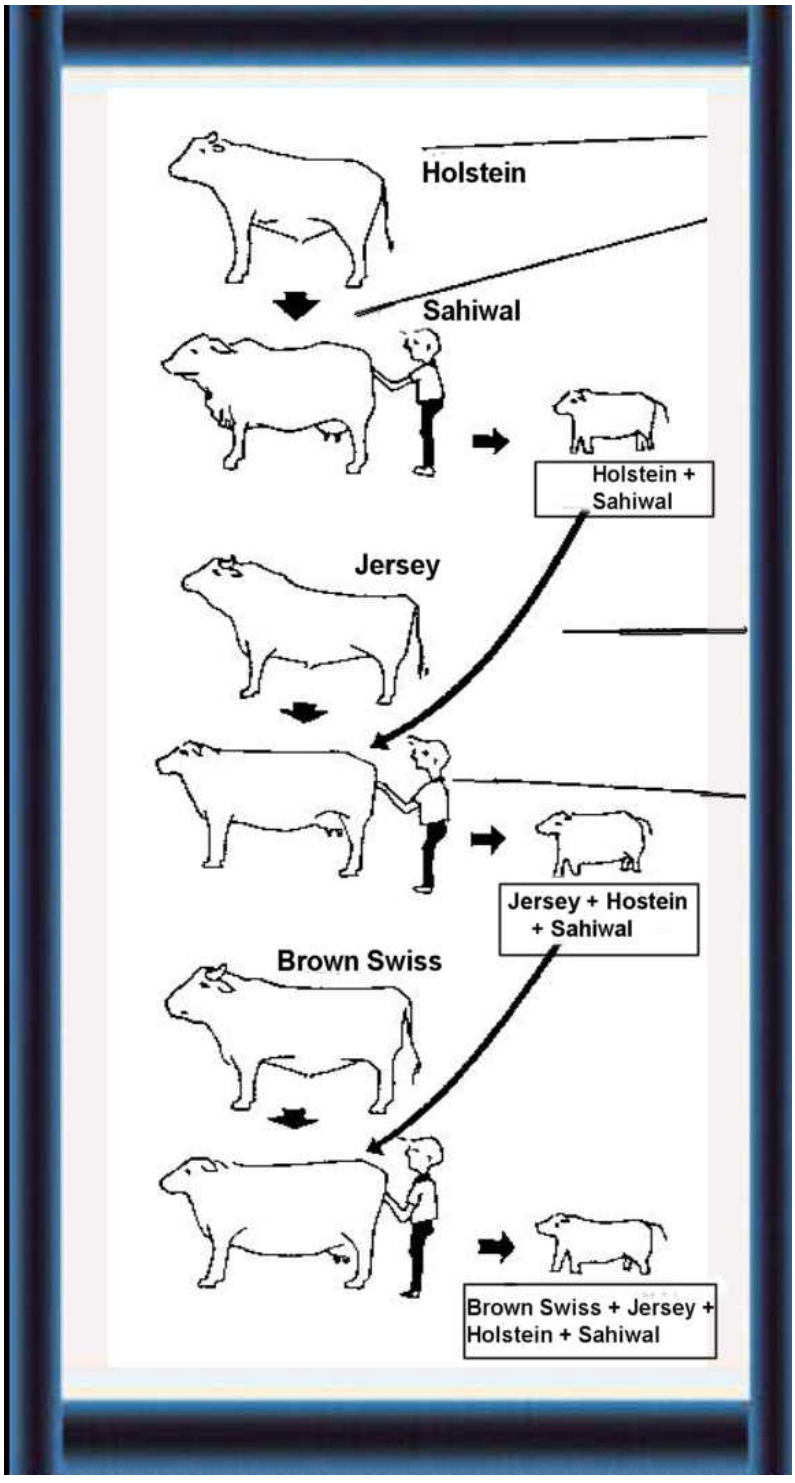
53 They found that genes from temperate cattle and genes from local cattle



54 can produce animals with high production which live happily
in local conditions.

Rotational cross-breeding

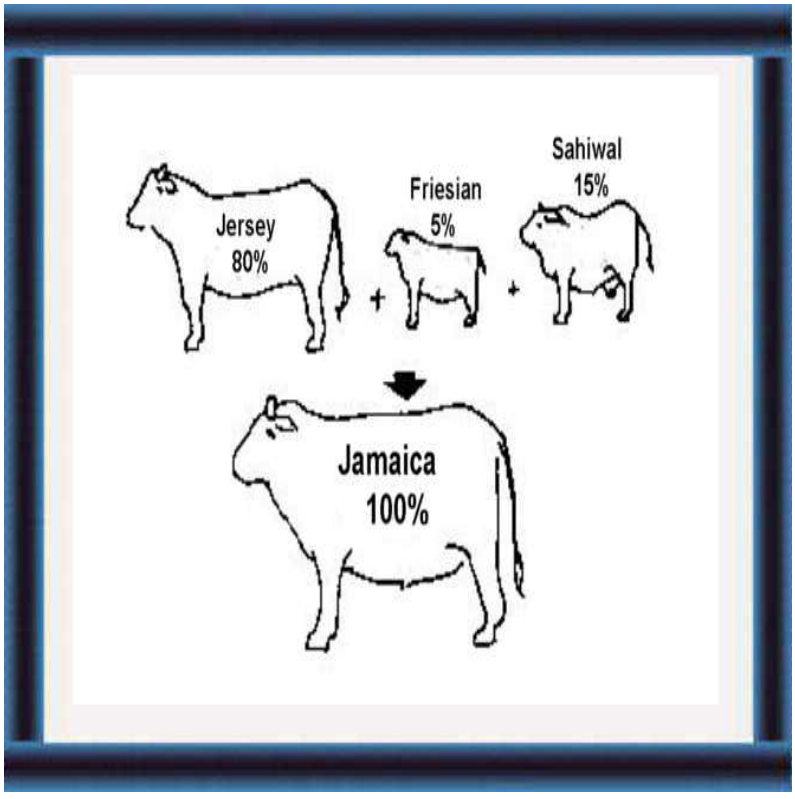
55 One temperate breed of Bull (e.g. Holstein) is cross-bred with a native cow (e.g. Sahiwal).



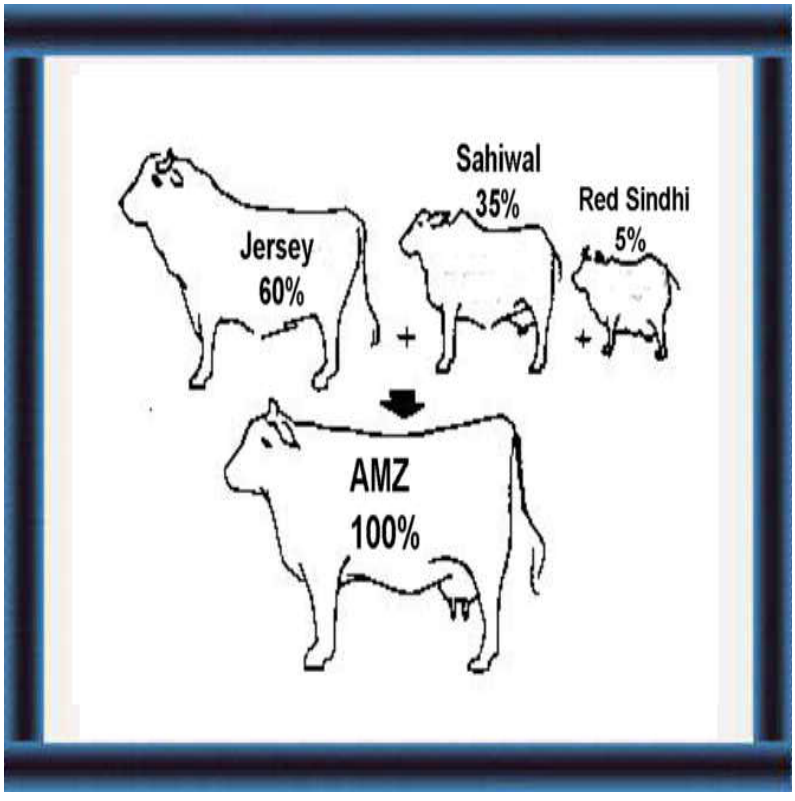
56 Then another temperate breed of bull (e.g. Jersey) is cross-bred with the cross-bred cow (Holstein-Sahiwal).

57 This is repeated with other breeds.

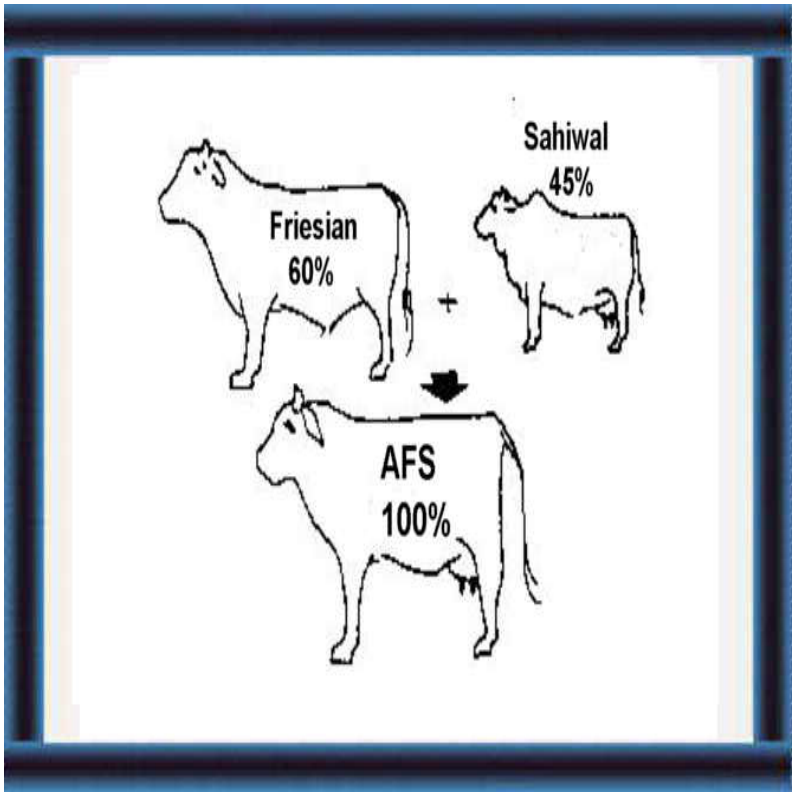
Synthetic breeds



58 **Jamaica Hope**
- 80 % Jersey (approximately)
- 5 % Friesian (approximately)
- 15 % Sahiwal (approximately).

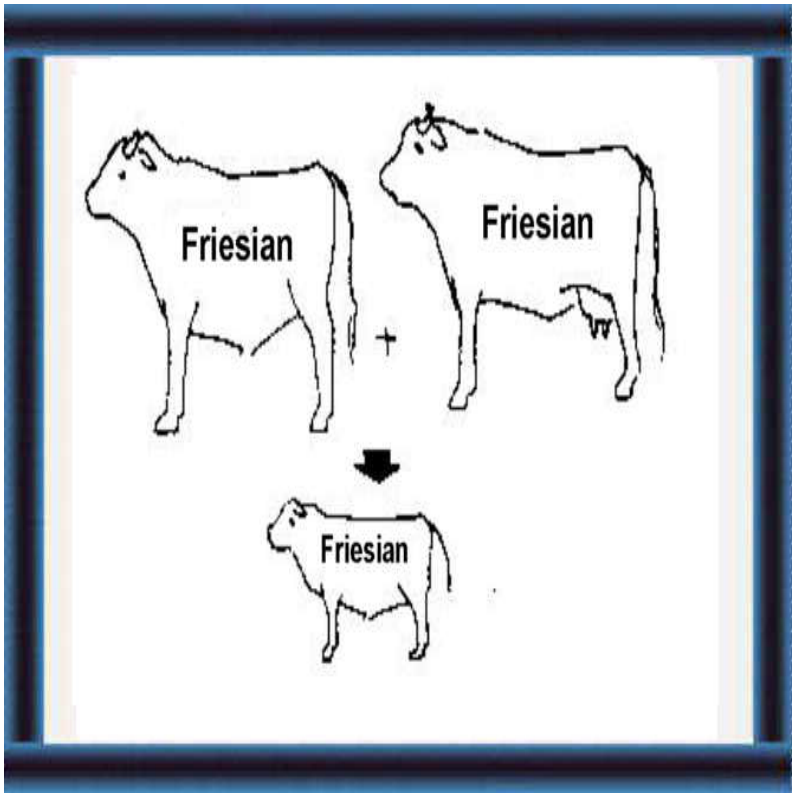


59 **Australian Milking Zebu (AMZ)**
- 60 % Jersey (approximately)
- 35 % Sahiwal (or more)
- 5 % Red Sindhi (or less).

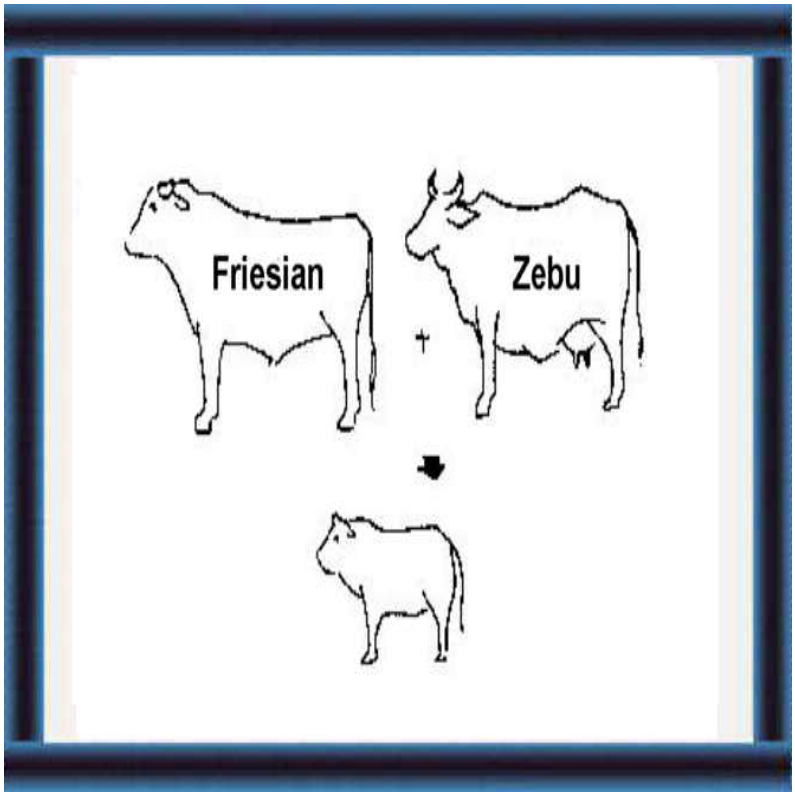


60 **Australian Friesian Sahiwal (AFS)**
- 60 % Friesian (or more)
- 45 % Sahiwal (or less).

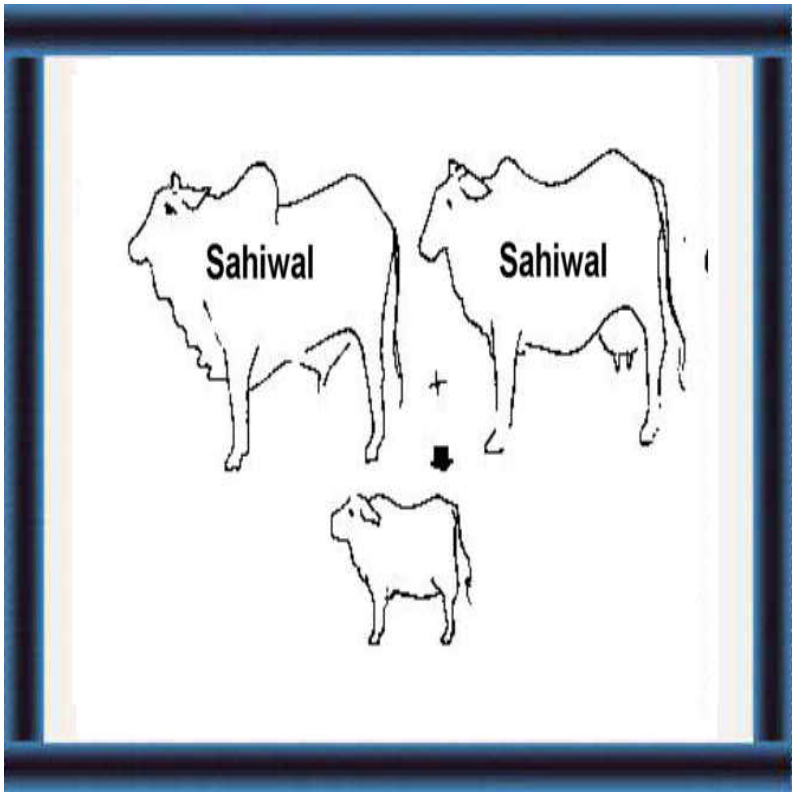
Recent country programmes



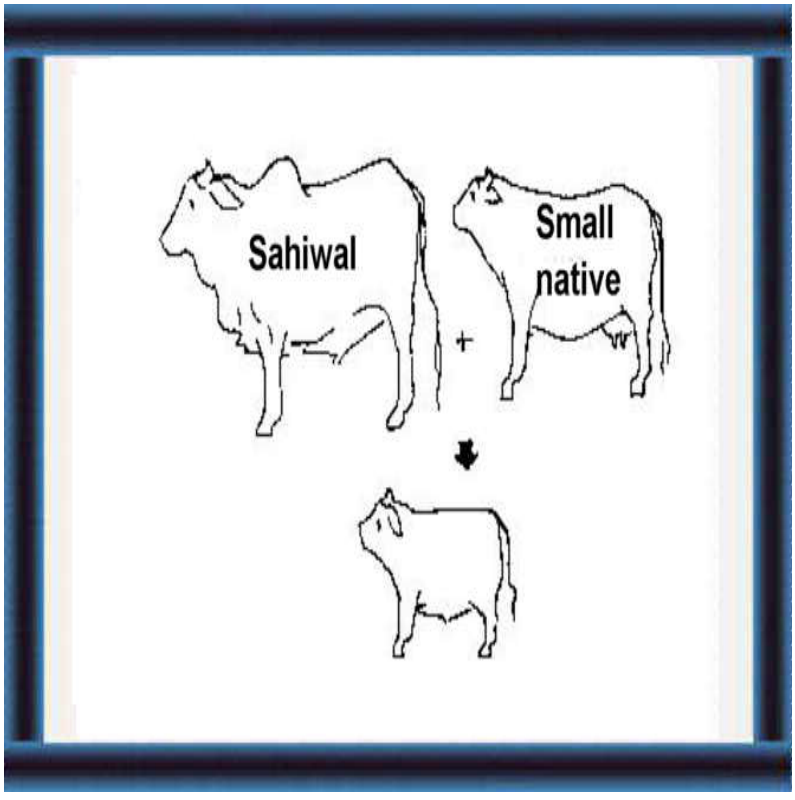
61 Some countries bring in pure-bred temperate cattle, especially Friesians.



62 Other countries cross-breed temperate and native cattle.



63 Pure-bred Sahiwal herds and careful selection within the breed are increasing production.



64 Some countries use good Sahiwal bulls to **upgrade native cattle** where it is difficult to use temperate breeds for cross-breeding (e. g. when A.I. is difficult).

65 Farmers and extension workers should try to use the best breeding programmes for their **local conditions**.

Buffalo breeding for milk production (66-68)

The five main breeds of dairy buffaloes found in India and Pakistan are being selectively bred for increased milk production.

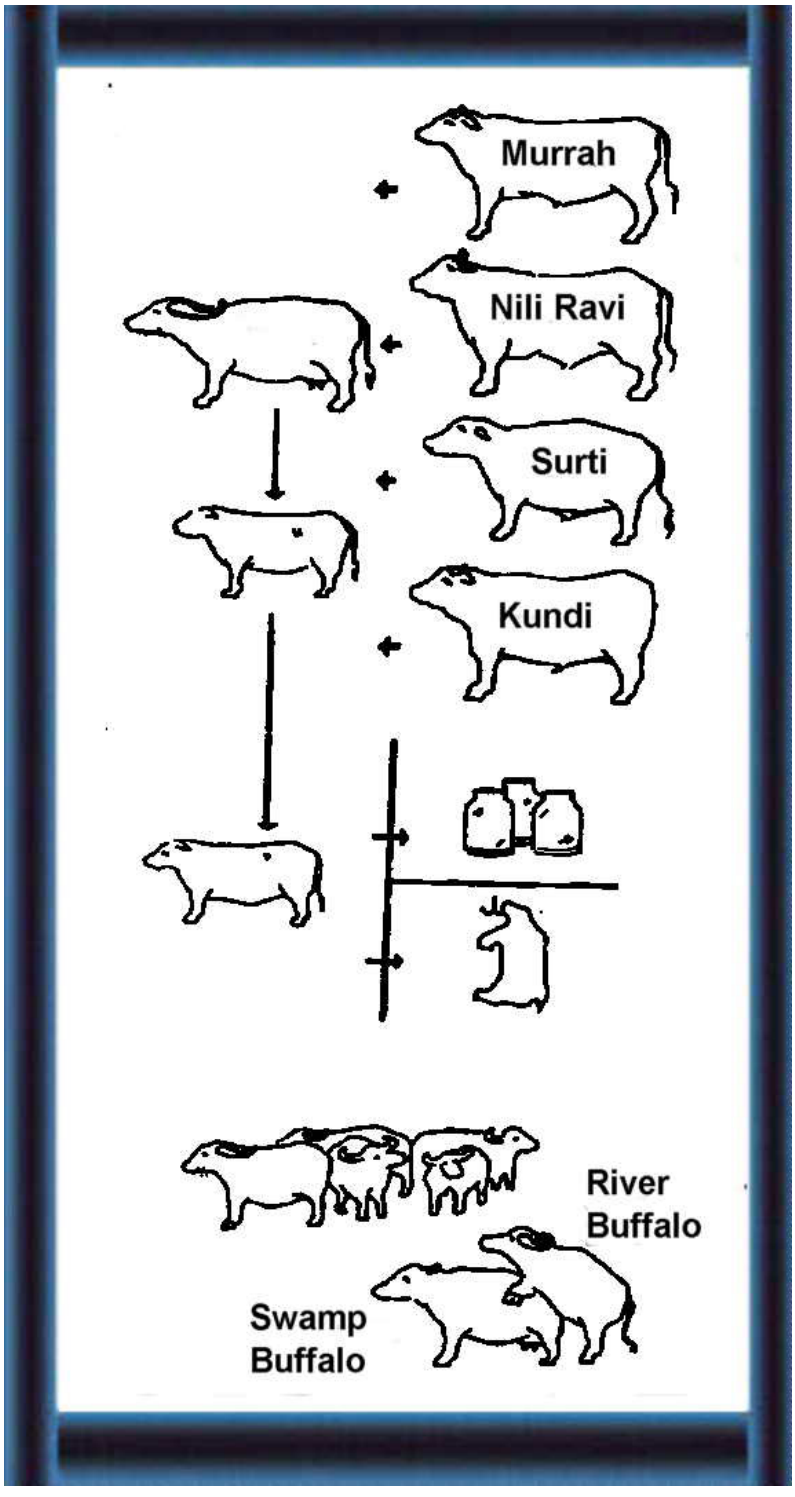
Programmes are being undertaken in many countries to improve the milk production potential of Swamp buffalo by crossbreeding with different dairy breeds (of the River type). Murrah, Nili Ravi, Surti and Kundi are the prominent breeds used.

Some reports indicate that the crossbred offspring perform better than either parent breed under similar conditions. More common are findings of an intermediate performance between the two parent breeds.

Nucleus herds of dairy buffalo breeds can be conveniently established in tropical countries (unlike the case of dairy cattle breeds like Friesian and Jersey). The bulls from the nucleus herds can then be used to breed the Swamp buffaloes even where A.I. is not feasible (again an advantage over the Friesian and Jersey bulls).

Dairy buffalo breeding

66 Many countries use River Buffalo to **upgrade Swamp Buffalo**, especially:



- Murrah
- Nili Ravi
- Surti
- Kundi.

67 The cross-bred cows produce as well as the River type parent or better.

68 It is easy to set up nucleus herds of River Buffalo bulls (unlike temperate cattle) and to use them for breeding.

What do you know about breeds of dairy cattle and buffalo?

Things to look for in different breeds

Major breeds of dairy cattle

Major breeds of dairy buffalo

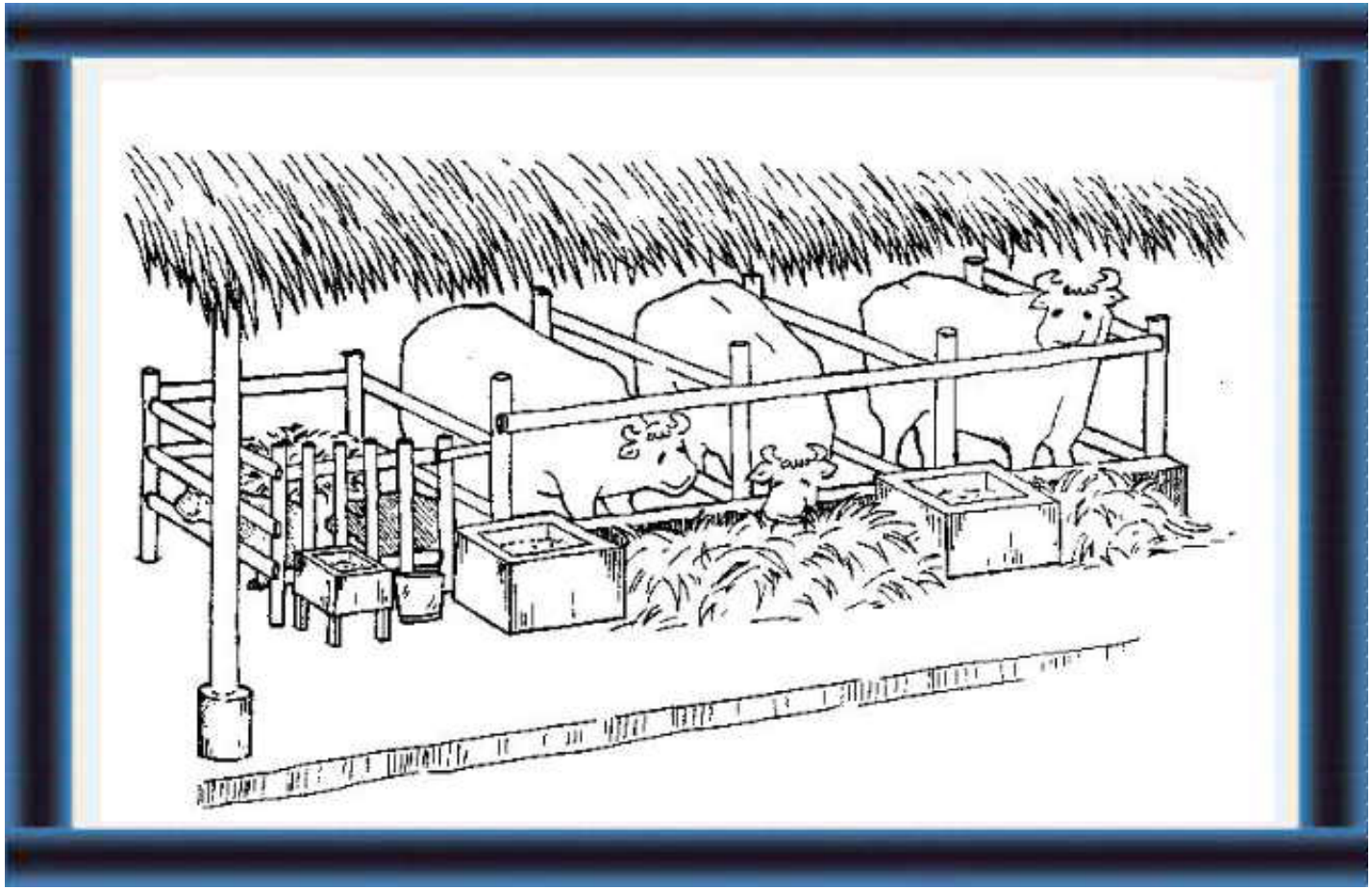
Small-Scale

Dairy Farming Manual

Volume 2

Husbandry Unit 3.1

PRINCIPLES AND DESIGN OF DAIRY CATTLE AND BUFFALO HOUSING



PRINCIPLES AND DESIGN OF DAIRY CATTLE AND BUFFALO HOUSING

Husbandry Unit 3.1:

Technical Notes

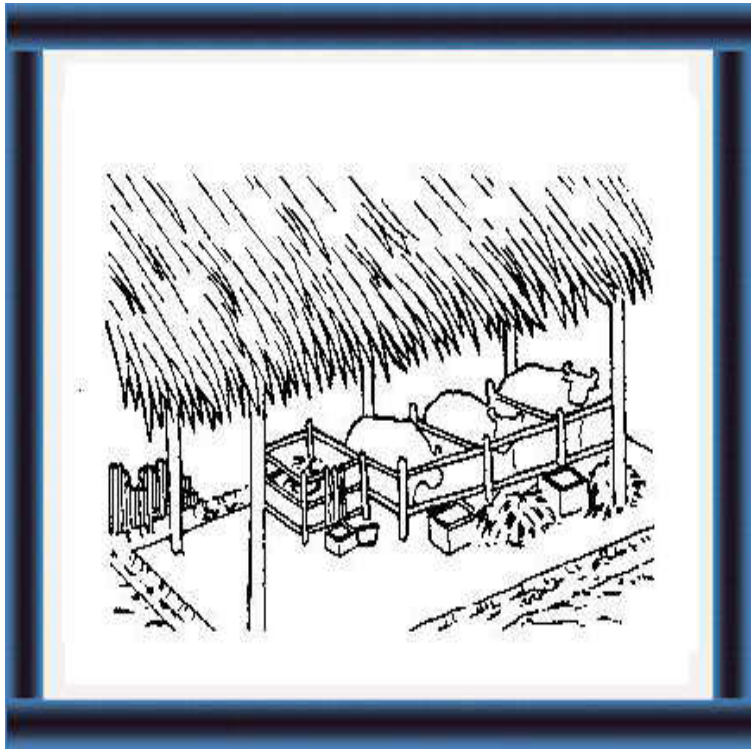
Note: Numbers in brackets refer to illustrations in the Extension Materials.

Extension Materials

What should you know about housing for dairy cattle and buffalo?

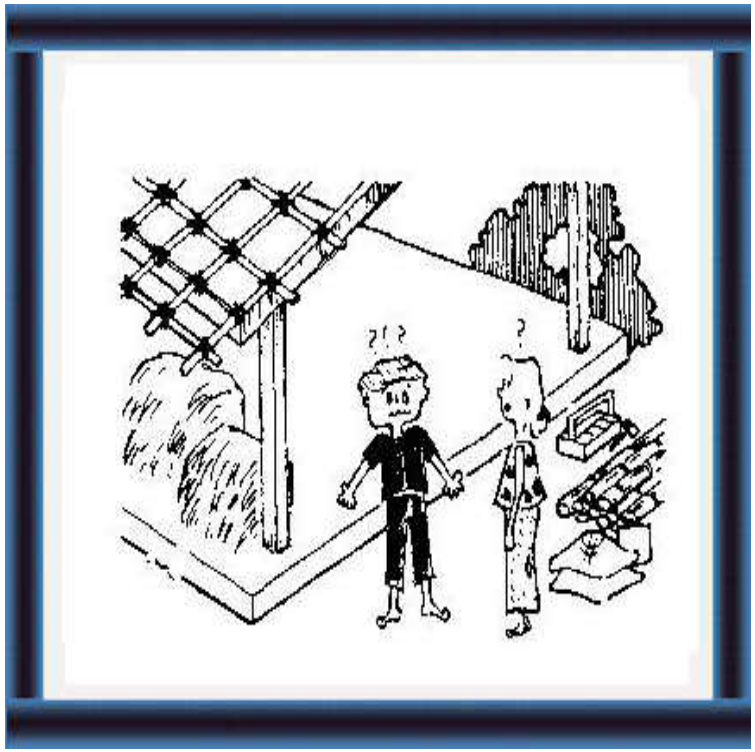
What is important in designing housing for your dairy animals? (4-19)

1 You should think about:
- comfort
- safety
- economy
- convenience.



How can you construct simple housing to meet the basic needs of your dairy animals? (20-36)

2 By careful planning of the location and basic design of your cattle shed.



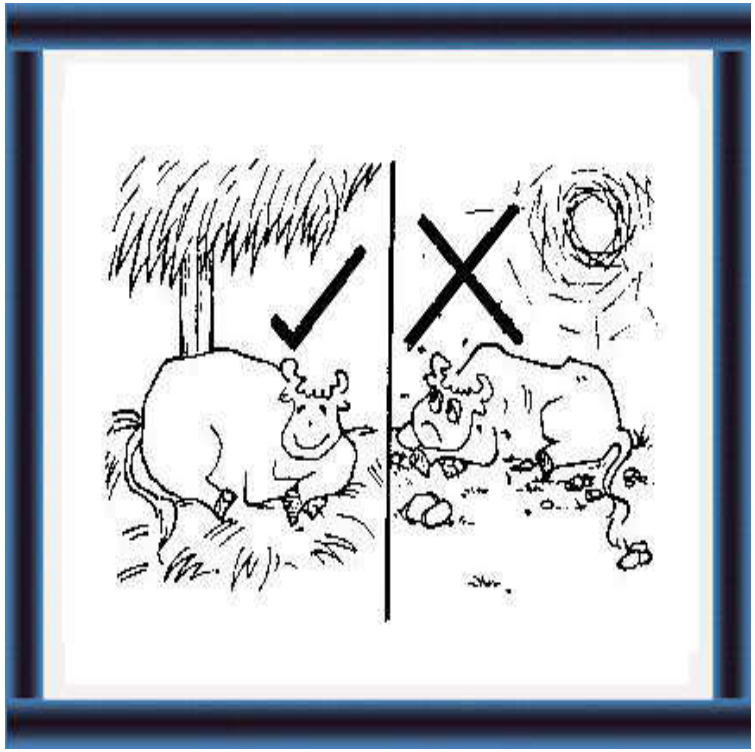
How can you construct improved housing to better meet the needs of your dairy animals? (37-147)

3 By making sure you understand what each improvement is for and how much it will cost you.

Important points in housing design

Some important aspects that must be taken into account in designing housing for dairy animals are:

- Optimum comfort for the animal so that it will produce most. This involves protection from rain and extremes of heat and cold and strong winds; adequate ventilation. (4-8)



animals?

Comfort

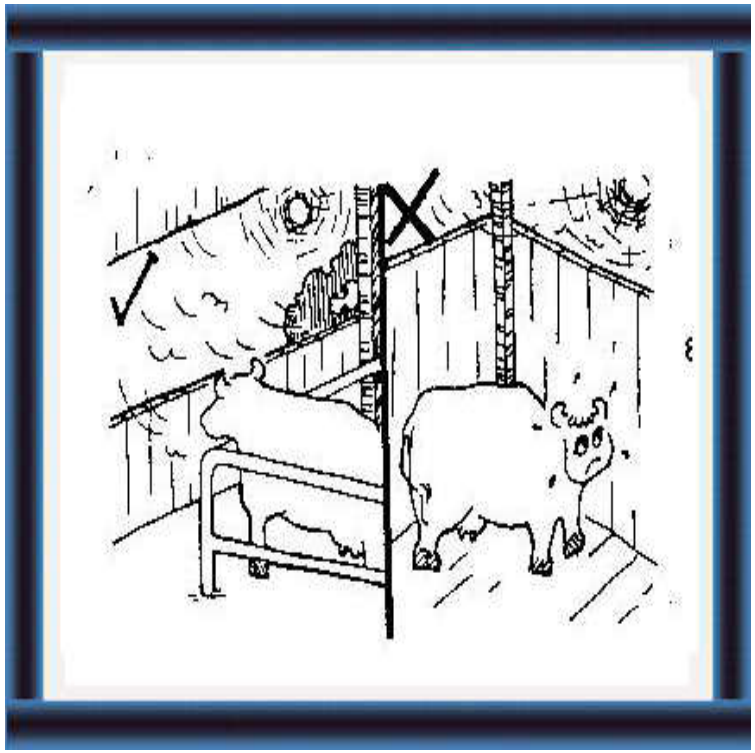
4 Make your animals **comfortable** so that they **produce more milk**.

5 **Protect** your animals from **rain** and **strong winds**.

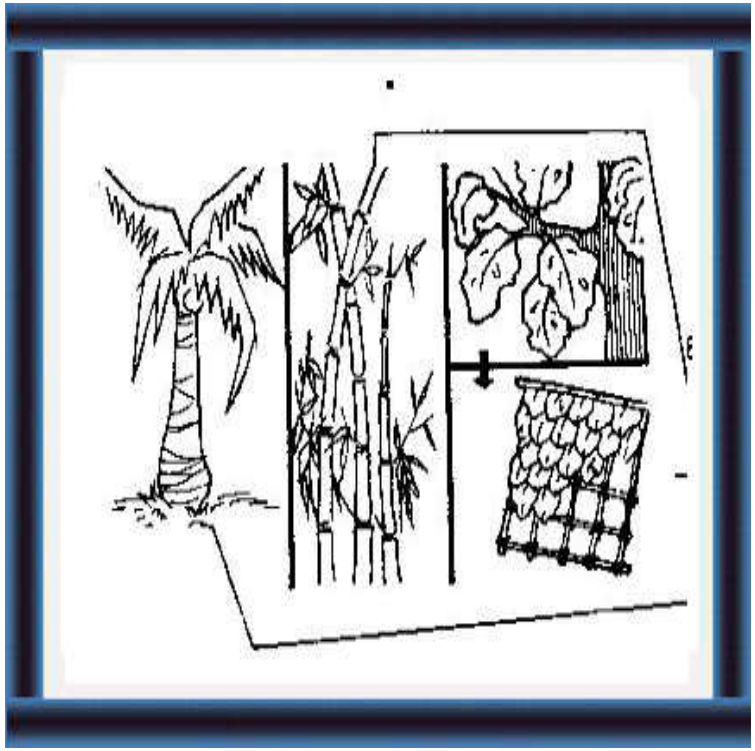
6 **Protect** your animals from **heat**

7 and from **extreme cold**.

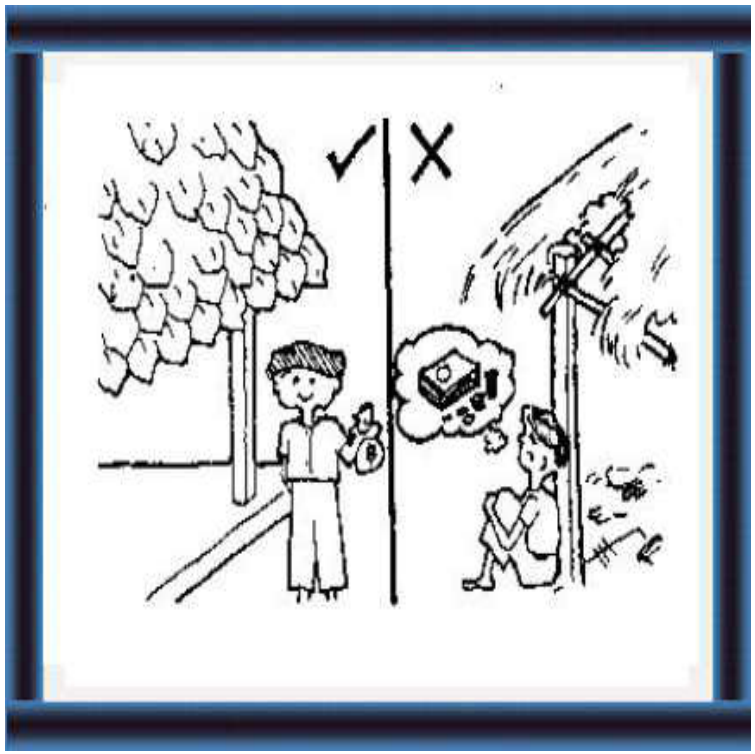
- Costs of construction and subsequent maintenance. (9-10
- Prevention of feed wastage. (11)



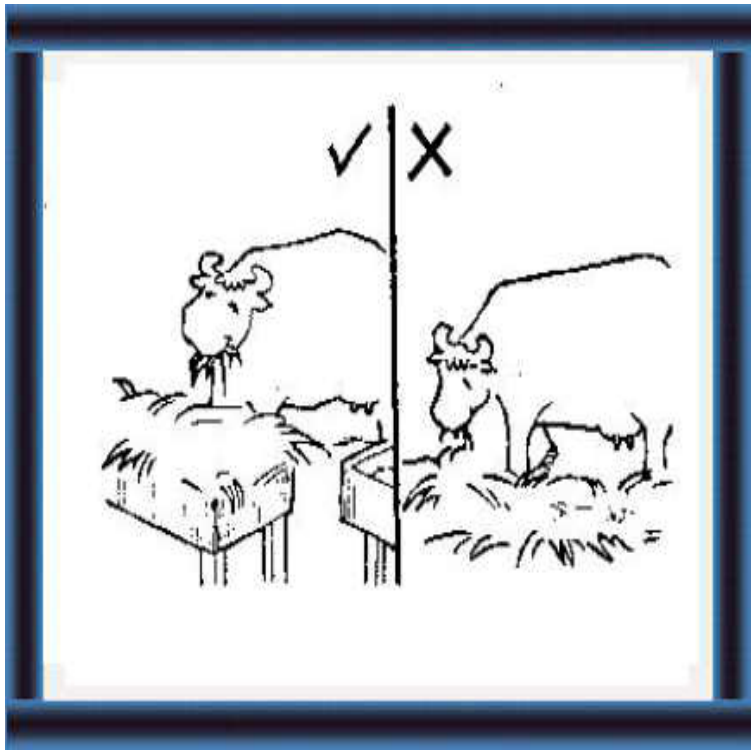
8 Make sure there is **good ventilation**.



Low construction and maintenance costs
9 Use **cheap** materials available **locally** e.g.
- bamboo and coconut
- seasoned leaves
- coconut frond mats (cadjan)

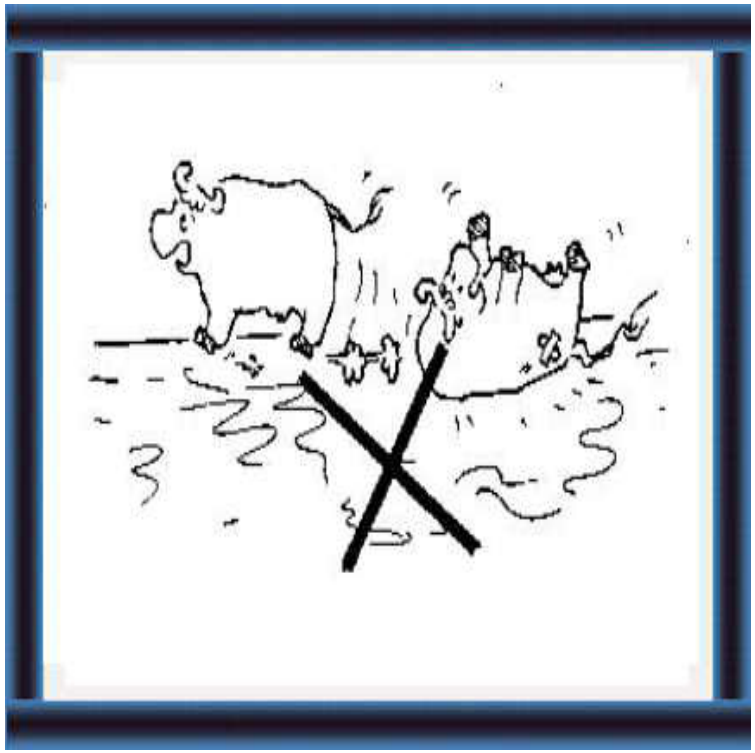


10 but choose **strong** materials so that your repair and maintenance costs are **low** too.

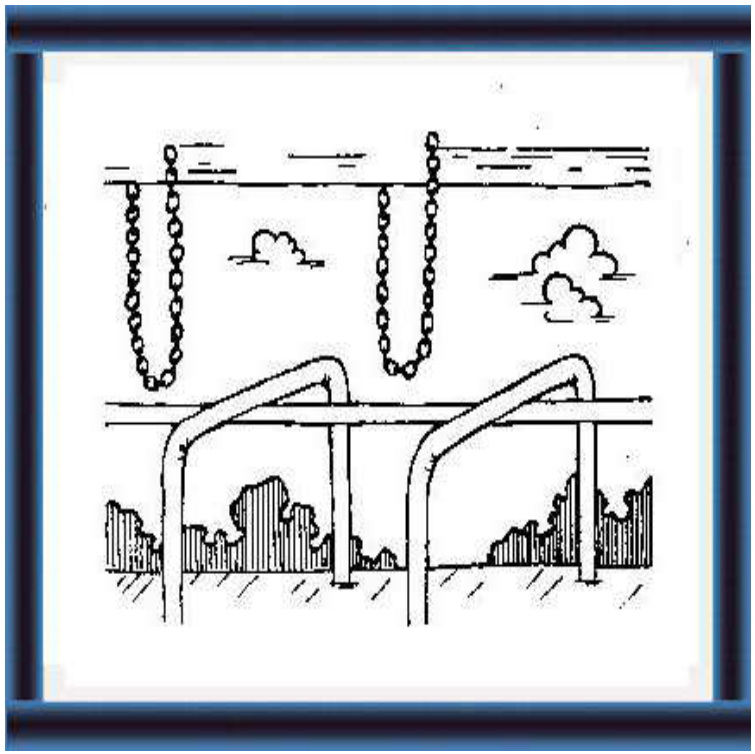


Preventing feed wastage
11 Your animals should feed easily from racks and troughs and not trample on the feed.

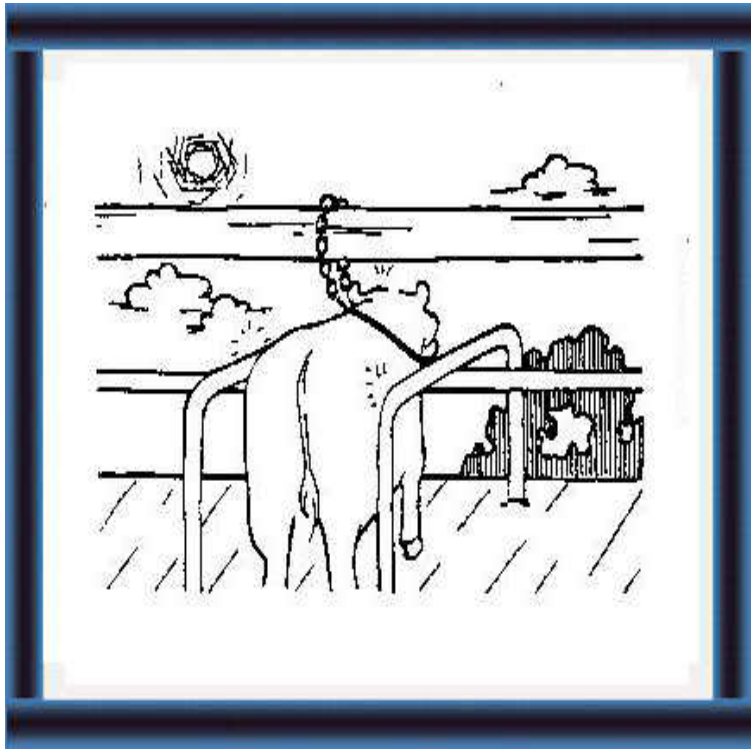
- Prevention of injury to animals. (12-15)



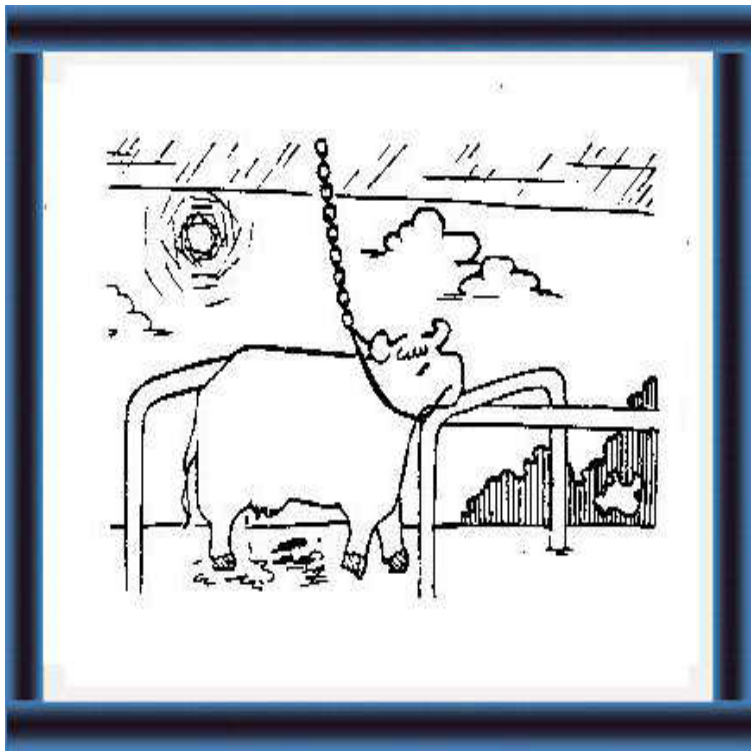
Preventing injury
12 Make sure the standing is **not slippery**



13 and there is the **right amount** of **space** for your animal to get up and lie down easily.

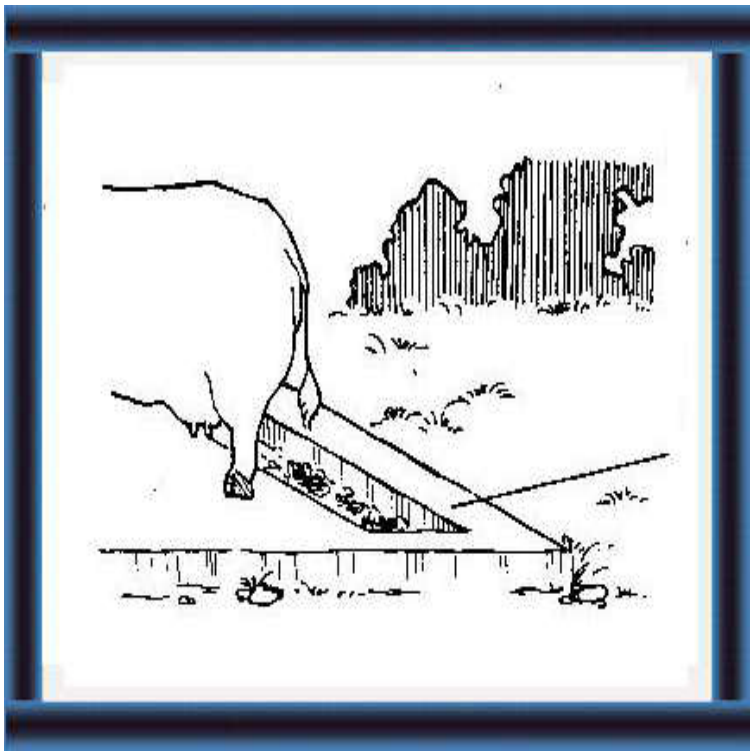


14 **Too little** space makes it difficult for your animal to lie down and get up and may cause **injury**.



15 **Too much** space allows your animal to move across and drop dung and urine on the standing.

- Easy and profitable disposal of dung, urine and other wastes. (16-18)
- Convenience for operational activities e.g. feeding, milking and maintenance of hygienic environment. (19)



Making use of wastes
16 In well-designed housing you can **easily remove** dung, urine and other wastes

17 and use them to make **compost manure** (See H. 1.2 Compost Manure)

18 or pass them through a **bio-gas digester**.
This also reduces the breeding of flies.

Ease of feeding, milking, cleaning
19 Well designed housing makes these operations easier (See below).

Construction of simple housing to meet basic needs

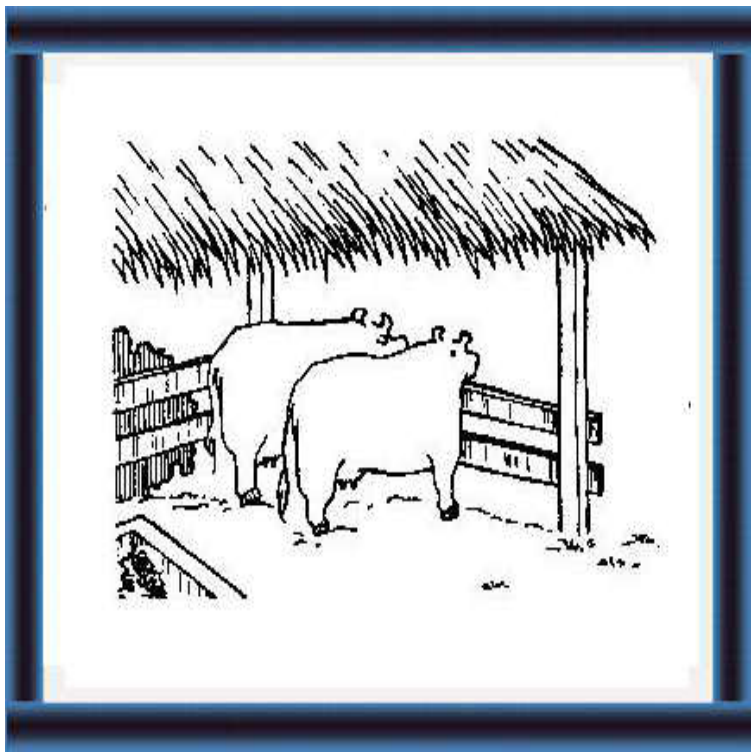
The more productive dairy cattle have a high metabolic rate which results in the production of a considerable amount of heat. Thus they would be more comfortable in a cold, dry climate than in a hot, humid climate because the former would be helpful in getting rid of the extra body heat. However, there are vast areas with hot and humid tropical climates in the region. The basic model presented, therefore, would be one suitable for these unfavourable conditions. Providing adequate ventilation and protection from excessive sunlight and heavy rains is extremely important under these conditions. This model can be easily modified to meet the needs of the climatic conditions, by providing half walls, curtains etc. where necessary.

The materials used for construction and the construction itself should not be too expensive. Many small farmers cannot afford such luxury even for their own dwellings. However, the material used should be durable, otherwise the costs of repairs and maintenance will be too high. Fortunately in most rural areas

less expensive material such as bamboo, coconut and other wood and cadjan (mats made of coconut frond), straw or other seasoned leaves are used traditionally and indigenous technology is available.

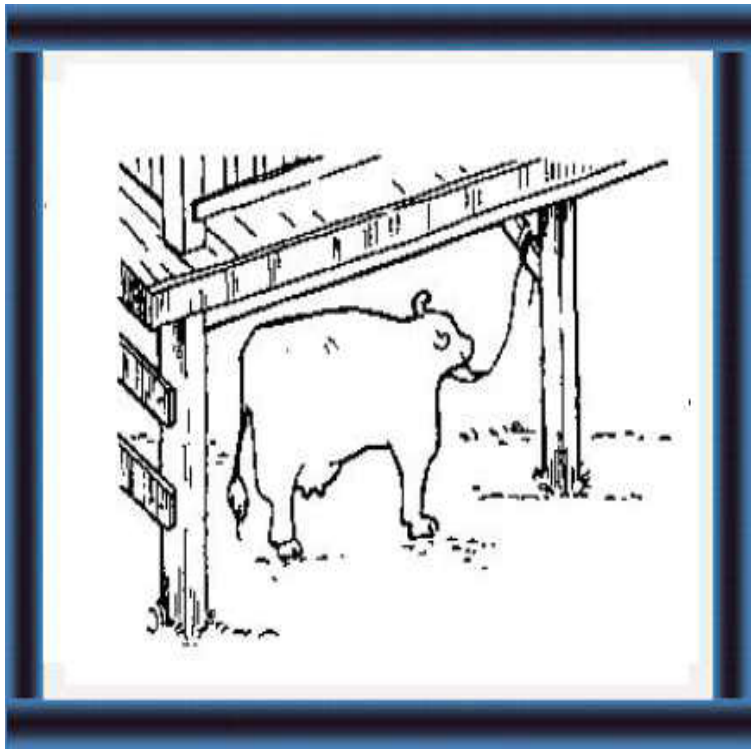
It is quite common for small scale producers with one to a few dairy cattle to house them in open sheds with an earth floor. Sometimes cattle may be kept in a basement under the human dwelling or under a stack of straw. Even though the animals may have shelter from sun and rain, and the construction costs are minimal, the other requirements are generally not met. (20-23)

Convenience for operational activities, e.g. feeding, watering, milking and maintenance of a hygienic environment, has to be provided for in designing the arrangements within the shed and in the actual construction. These are discussed under the layout, floor construction etc. as appropriate.

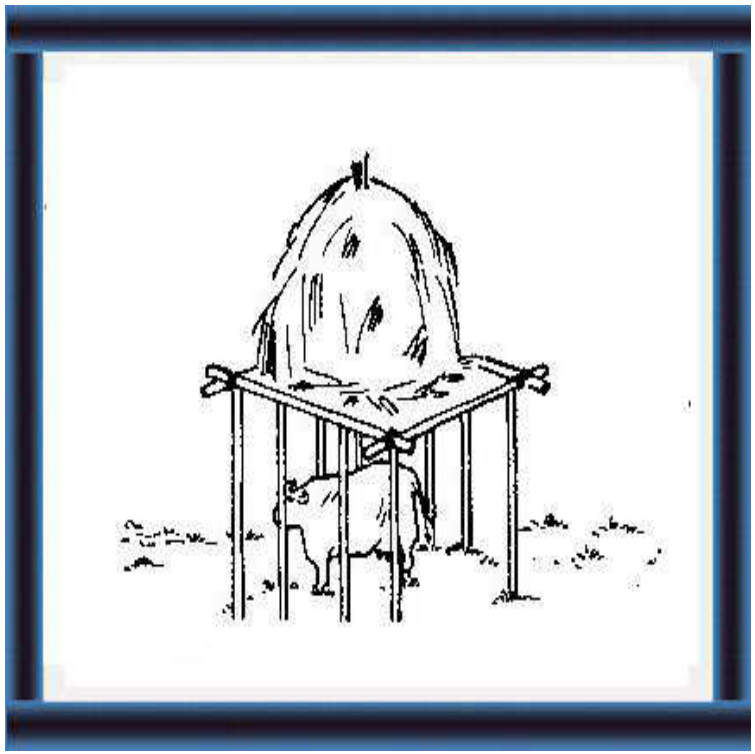


How can you construct simple housing to meet the basic needs of your dairy animals?

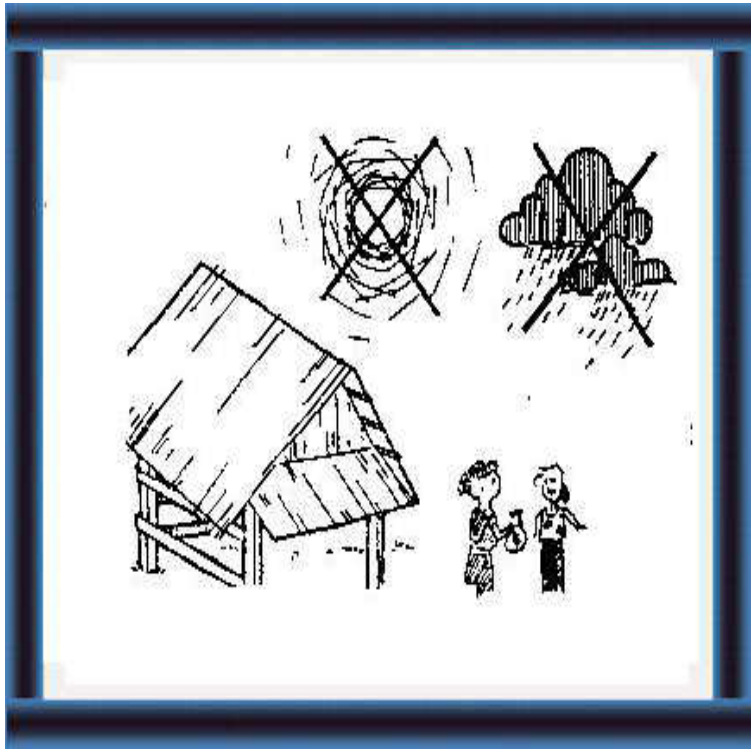
20 Many small scale farmers house their dairy animals in **open sheds** with **earth floors**.



21 Other farmers keep their animals in a **basement** under their house



22 or under a stack of **straw**.



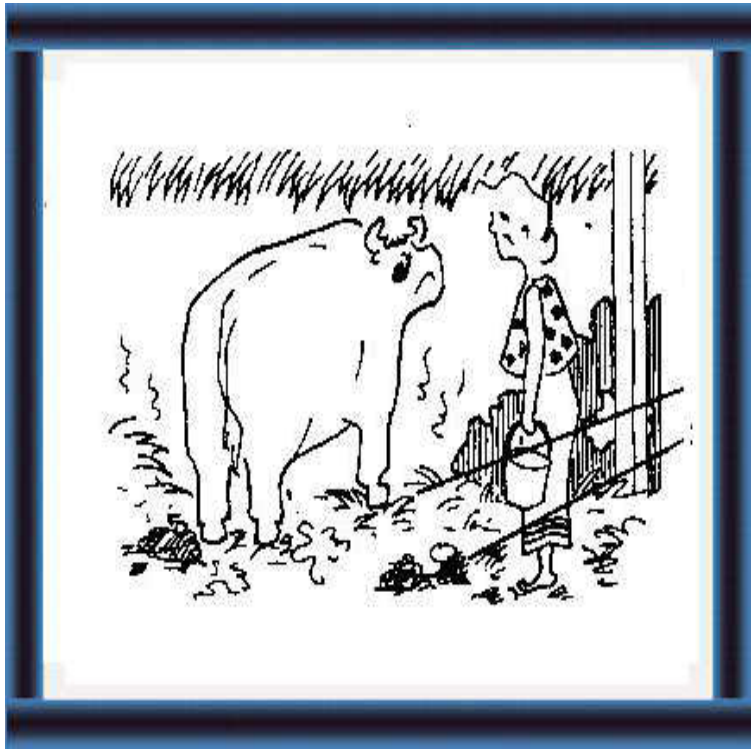
23 Although this housing protects your animals from sun and rain and is cheap to build

---

Wastage of feed by trampling, inability to make full use of the urine as a source of fertilizer and inability to maintain a hygienic environment resulting from the formation of pools of mud and urine etc. are some of the problems. (24-25)

Most of these problems can be overcome to a very great extent by:
- Constructing the shed in a well drained area and having a shallow drain around the shed. (26)

- Having a systematic arrangement within the shed for tying the animals, preferably in a row, with appropriate space between animals and a separate area for the calves. (27)

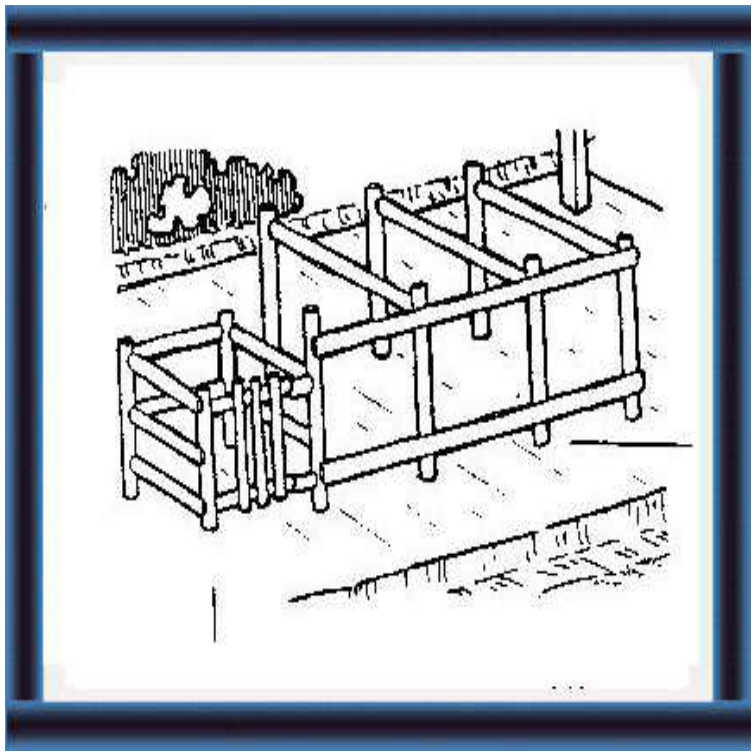


24 there are problems of:
- **feed wastage** by trampling
- **difficulty** of **cleaning** dung, urine and mud (unhygienic environment)

25
- **not** making **good use** of dung and urine.

Good design of housing can **overcome** these problems.

26 Construct your shed in a **well drained area** and make a **shallow drain** around your shed.

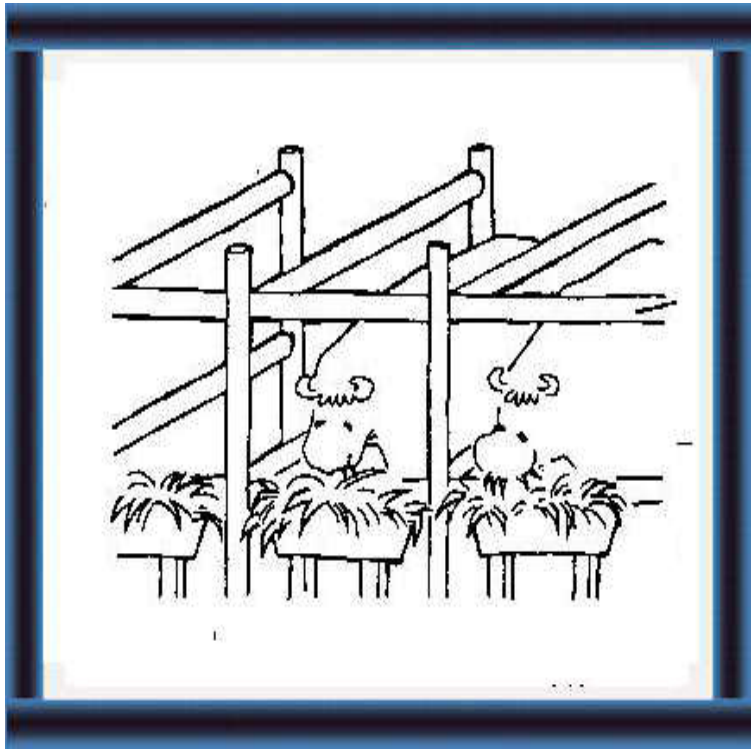


27 Make a good structure for **tying** your animals, best in a **row** with the **right space** and a **separate area** for calves.

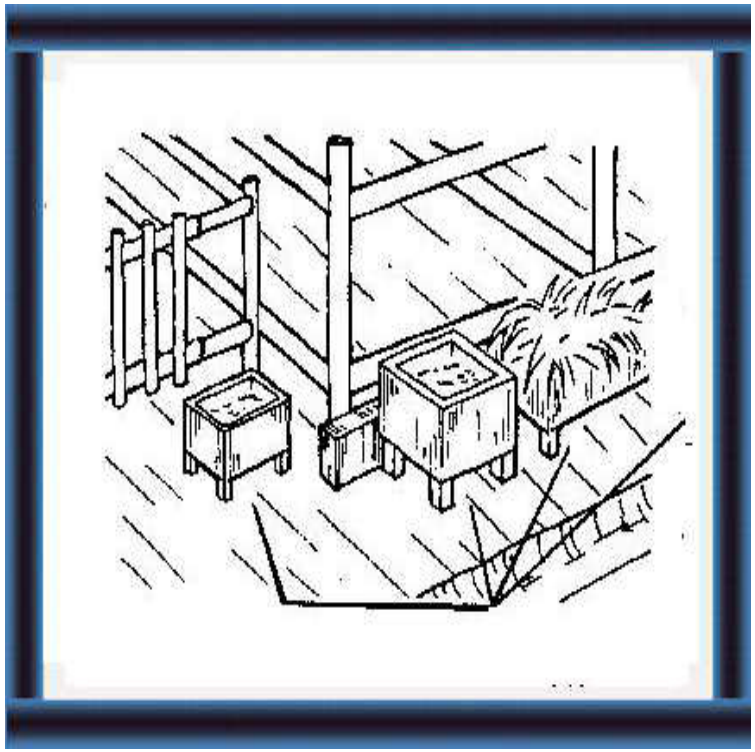
- Having a partition between the animals and the feed area to prevent the trampling of roughage feed, and offering concentrates/minerals and water in suitable containers. (28)

- Waste of feed, specially by trampling, is prevented by designing a suitable feed trough from which the animal can conveniently pick up its feed, whether it be cut and preferably chopped roughage or concentrate. (29)
- Making the roof leak-proof i.e. maintaining the roof in a good state of repair, especially during rainy weather. (30)
- Ramming the floor adequately with gravel to have an even floor and attending to the floor regularly to prevent uneven areas developing. (31)

Injury to the animal is prevented by constructing a non-slippery standing, allowing adequate space for the animal to lie down and get up without obstruction. Space between animals has to be restricted, however, to prevent them moving across the standing, dropping dung and urine on the standing.

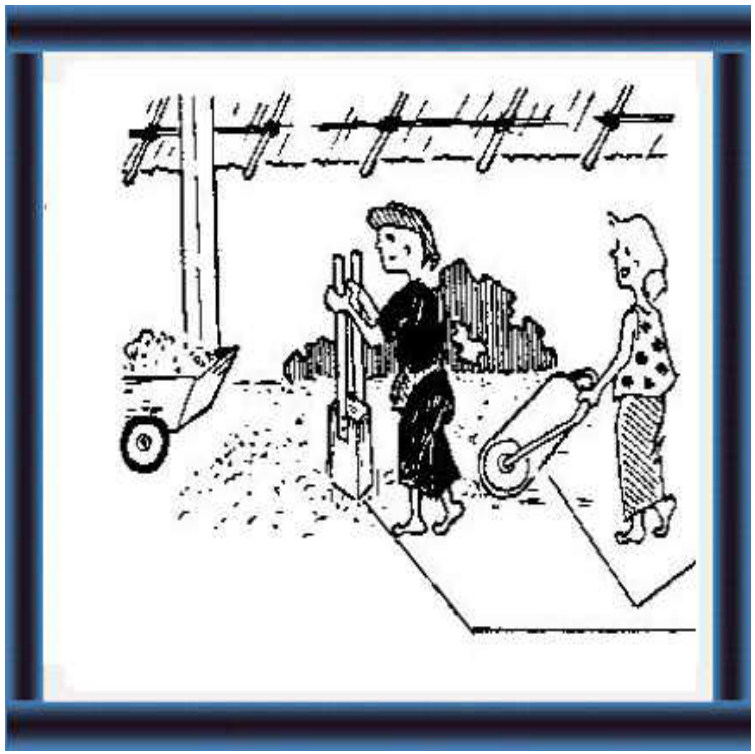


28 Make a **partition** between your animals and the feed area.
This **prevents** the **trampling** of roughage feed.



29 Make suitable **containers** for **concentrates/minerals** and for **water**.

30 Make sure your roof does **not leak**.
Check it and repair if necessary **before** the **rainy season**.

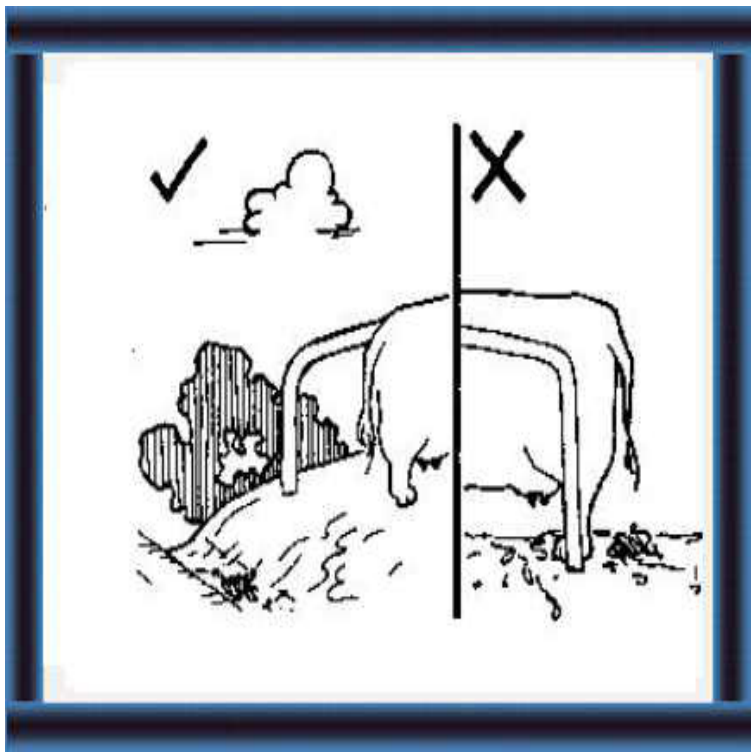


31 Make sure the shed **floor** is **even**.
Ram it with **gravel** and use a **roller**, if possible.

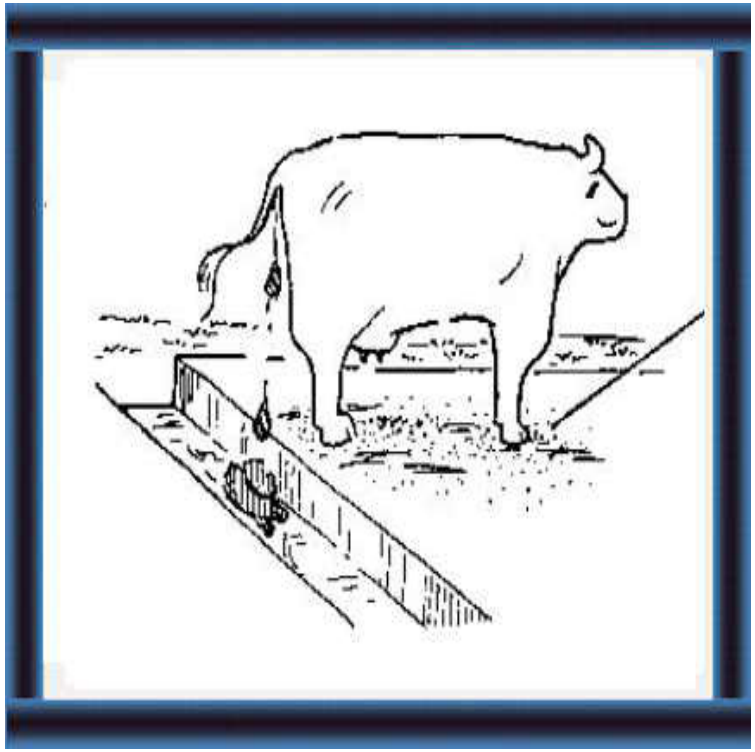
- Providing a sufficient slope to prevent urine and water flowing towards the animal or stagnating in pools. (32)
- Providing suitable bedding such as saw dust, left over roughage, straw etc. into which some of the urine may be absorbed and which can subsequently be used for compost making. (33)

It would be advantageous if dung, urine and other wastes could be disposed of in a manner that would facilitate the production of compost. By arranging for the dung and urine to pass through a bio-gas digester, an additional benefit of a supply of bio-gas can be obtained, at the same time reducing the breeding of flies.

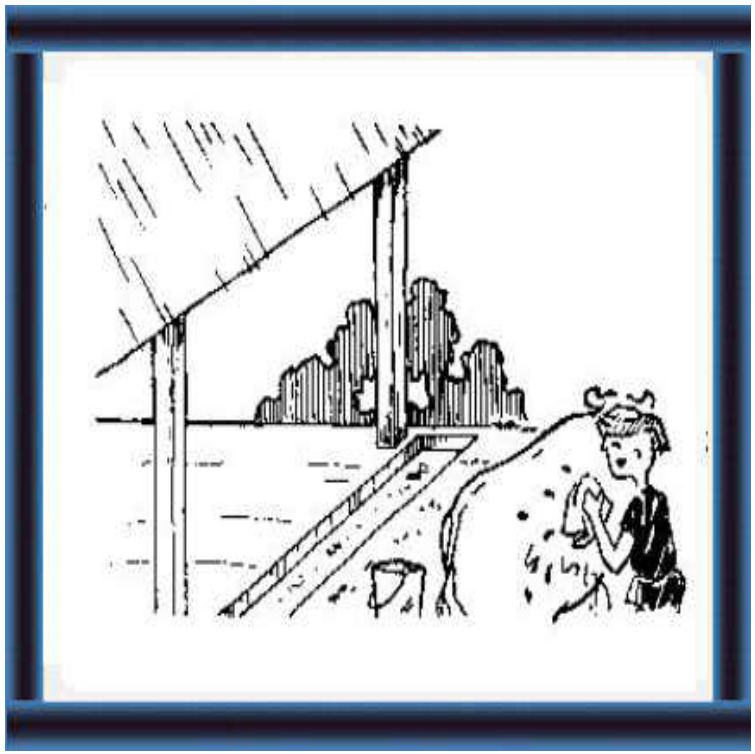
- Taking the animal outside the shed for bathing, washing, spraying etc. (34)
- Providing curtains made of material available in the area e.g. bamboo strips, cadjan etc. to prevent rain beating in and cold draughts disturbing the animals (where applicable). (35)



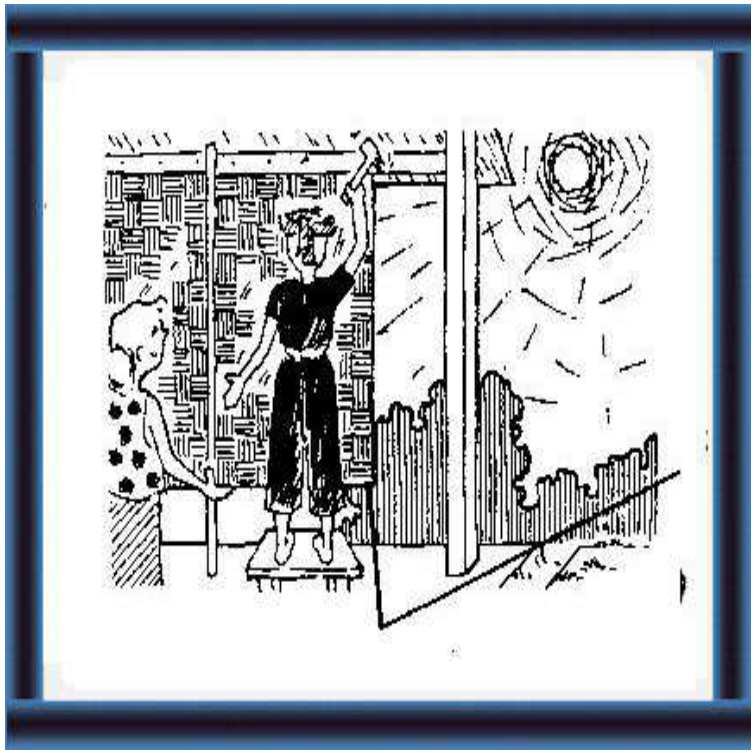
32 Make sure your floor has **enough slope** so that water and urine
- do **not pool**
- **flow away** from your animal.



33 Lay down **suitable bedding** e.g. saw-dust, straw, left-over roughage to soak up urine and to make compost manure.



34 Take your animals **outside** the shed for washing, bathing, spraying etc.



35 Use **curtains** made of local materials (bamboo strips, coconut fronds etc) where rain or cold draughts may disturb your animals.

- Growing a few trees at a suitable distance away from the shed to provide shade and also to serve as a wind barrier where appropriate. Fruit trees, tree legumes etc. are suitable. (36)

Construction of improved housing

The basic simple model can be improved upon in various ways. Some examples are discussed below. Before making recommendations to farmers, the extension officers should:

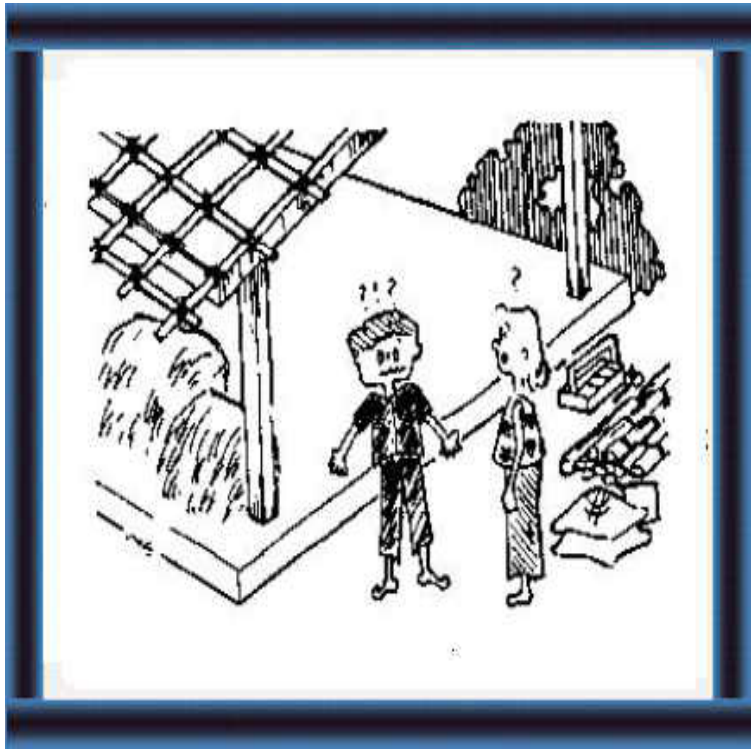
- Understand the benefits of these improvements. (37)

- Work out their costs, as applicable to the particular situation. (38)

- Discuss with the respective farmers the relevance of these

improvements to their particular situations. (39)

36 **Grow trees** (fruit, legume etc) at a suitable distance from your shed to **provide shade** and **stop strong winds**.



How can you construct improved housing to better meet the needs of your dairy animals?

37 In many ways but **make sure**:

- you understand how the improvements will help you

38

- you know **how much** the improvements **cost**

39
- you **discuss** with **other farmers** who have already made improvements.

Siting the cow shed

If the cattle/buffalo are to be kept in the basement under the human dwelling or if a shed is to be constructed making use of an existing wall of a house, there will be very little choice in siting the cattle shed. (40)

If a choice is available, the following should be taken into account in siting.

- Well drained and at a higher elevation. (41)

- Trees for shade and to serve as wind breaks or possibility of growing them if no trees exist.

- Avoiding direct draught into shed and preventing severe winds blowing off the roof. (42)

- Convenient access, for supply of feed and water etc. and removal of milk. (43)

Siting your cow shed

40 If you keep your animals:
- under your own house
- or in a shed attached to your house
the site is already selected.

41 If you can choose, your site should be:
- **well drained**
- on **high ground**

42
- **near trees** for **shade** and **wind breaks** or where you can grow trees
- where there are **not strong draughts** to make cattle ill or strong winds to blow the roof off

43
- easy to get to:
- to **bring feed** and **water**
- to **take away milk**.

The layout

The layout is usually constrained by the availability of space and funds in the small farmer situation. Several alternatives can be considered. Flexibility, cost saving and optimum utilization of space (e.g. ceiling to store hay or straw) are important criteria. (44)

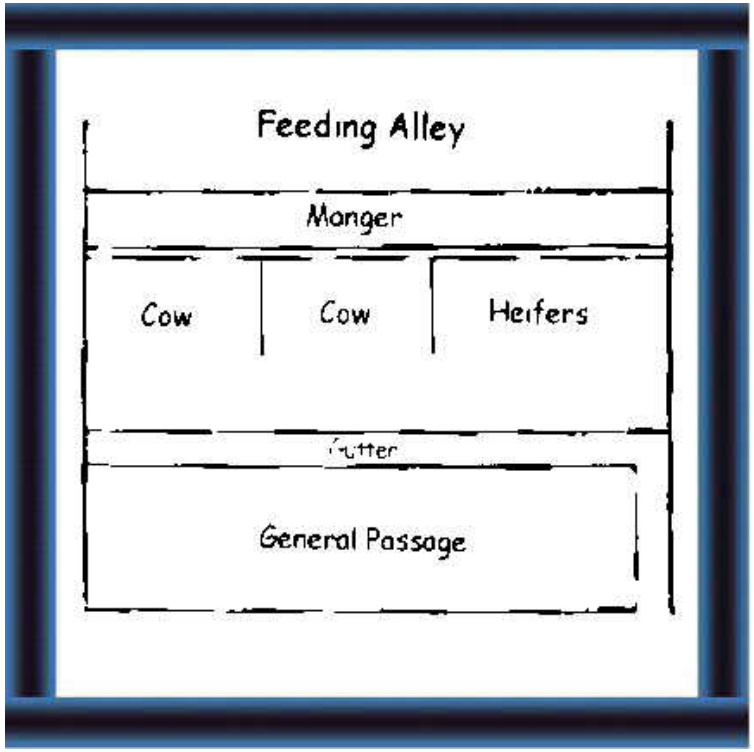
- If making use of an existing wall, an elongated shed can be constructed and an area can be separated for calves etc. (45)

- If making use of the basement of a human dwelling, an appropriate arrangement has to be devised, keeping in line with floor area. It may be that only Module 1 (see below) can be accommodated initially. (46-47)

Layout
44 Small scale farmers should think carefully about
- **good use** of **space**
- **low costs**.

45 You can construct a shed against an **existing wall** and make a **separate area** for **calves**.

46 If you use only the area under your house



47 you may use only **Stage 1** of the cow shed plan (see below).

- If adequate space is available, several alternatives can be considered. Two of them are presented here.

Open cattle shed for 2 cows/1 heifer/2 calves. The design was developed by MLDC/Sri Lanka. (48-51)

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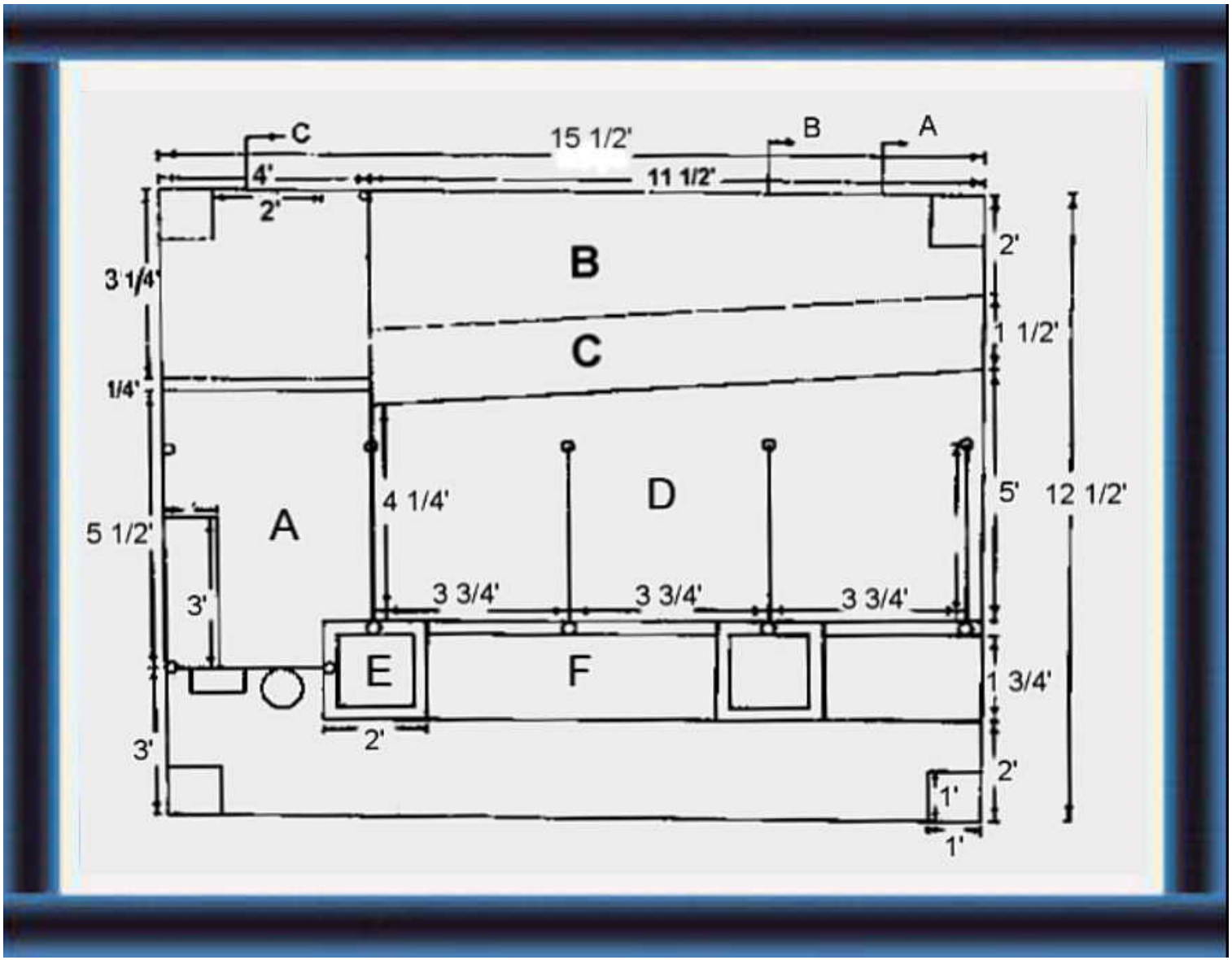
48 If you have enough space, you could construct an open cattle shed for 2 cows, 1 heifer and 2 calves.

49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15 1/2'
B
A
4'
11 1/2'
2'
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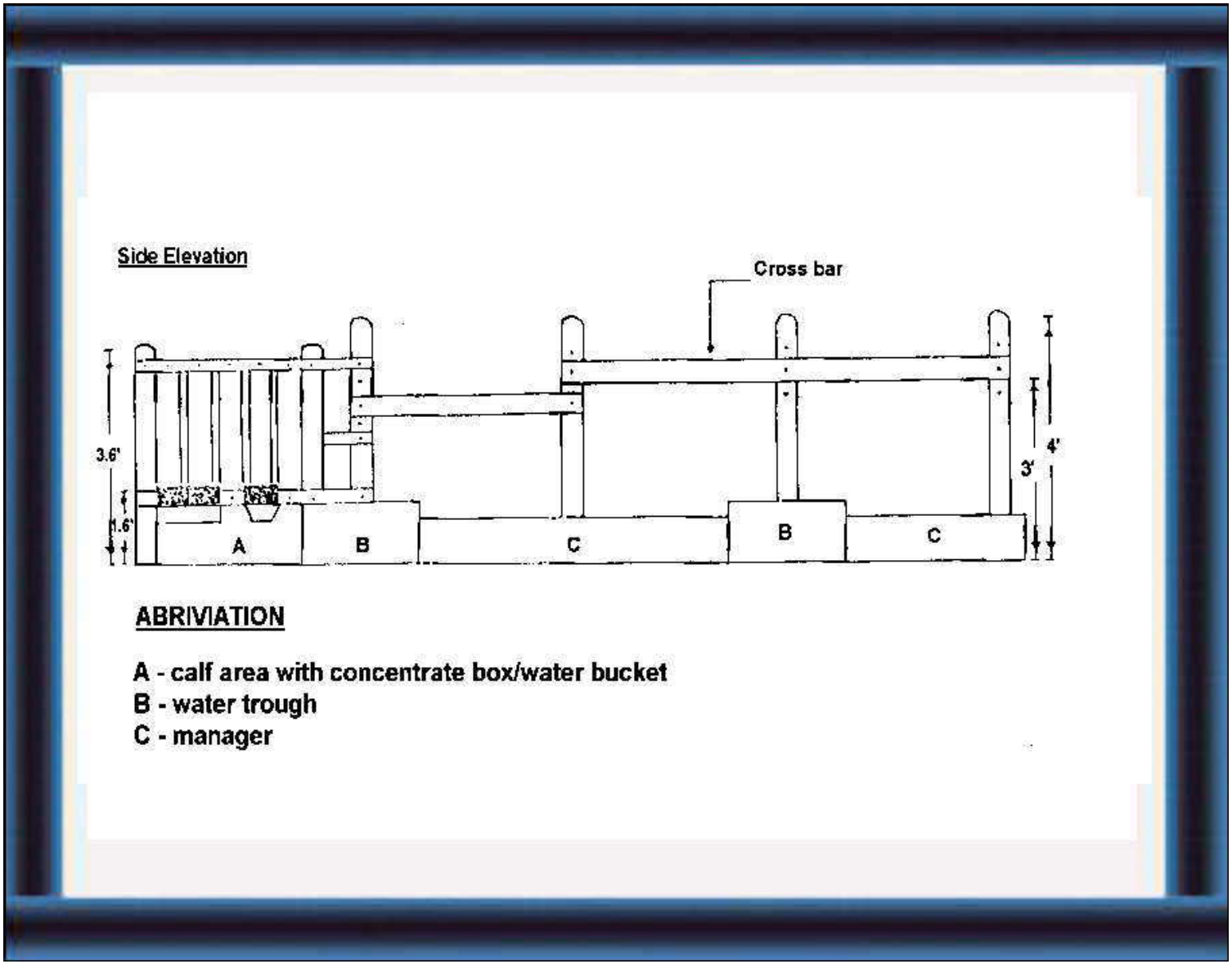
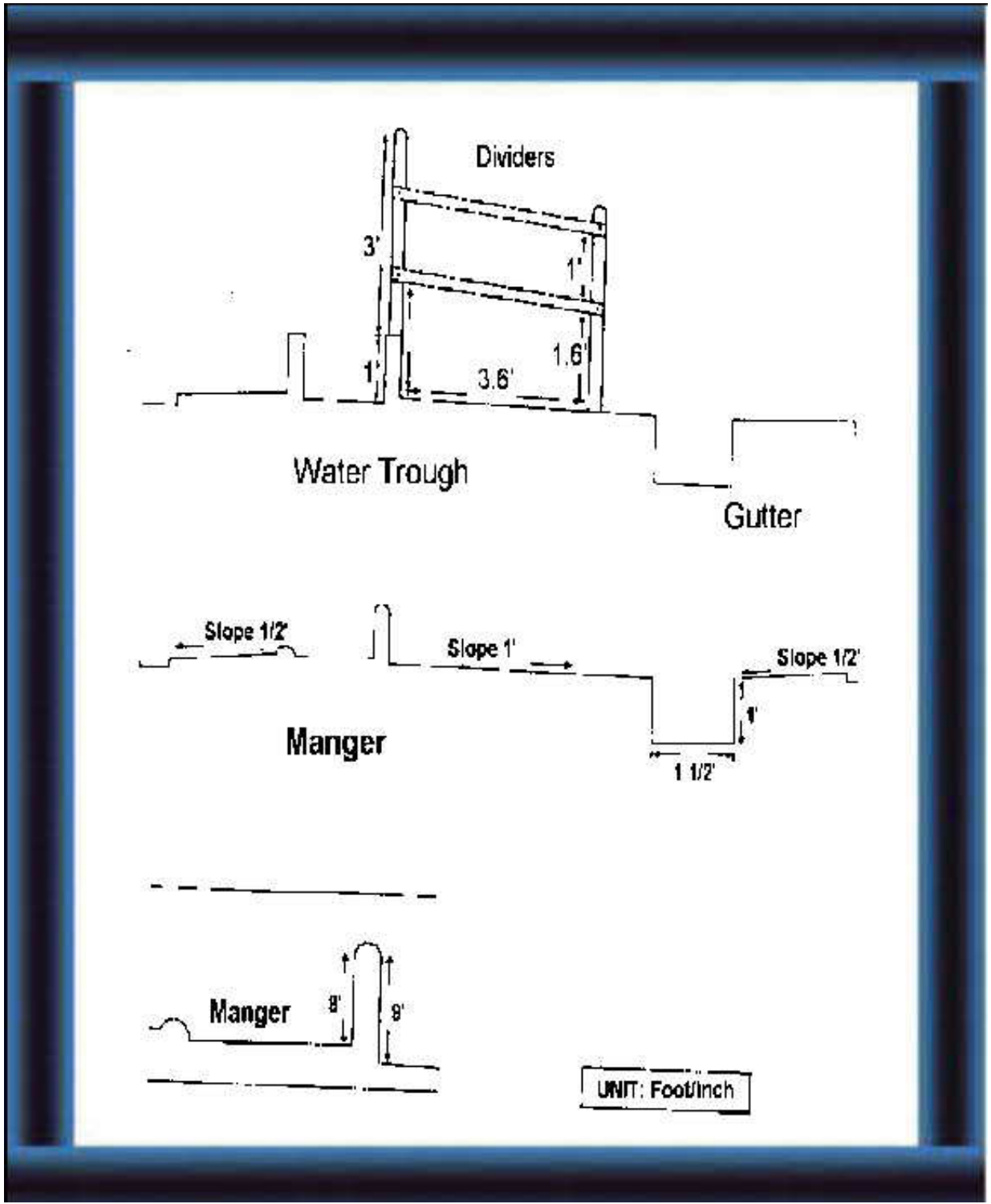
F
1 3/4'
2'
3'
2'
1'
1'

50


Side Elevation
Cross bar
3.6'
1.6'
3'
4'
A
B
C
B
C
ABRIVIATION
A - calf area with concentrate box/water bucket
B - water trough
C - manager


Dividers
3'
1'
1.6'
1'
3.6'
Water Trough
Gutter
Slope 1/2'
Slope 1'
Slope 1/2'
1'
Manger
1 1/2'
Manger
8'
8'
UNIT: Foot/inch

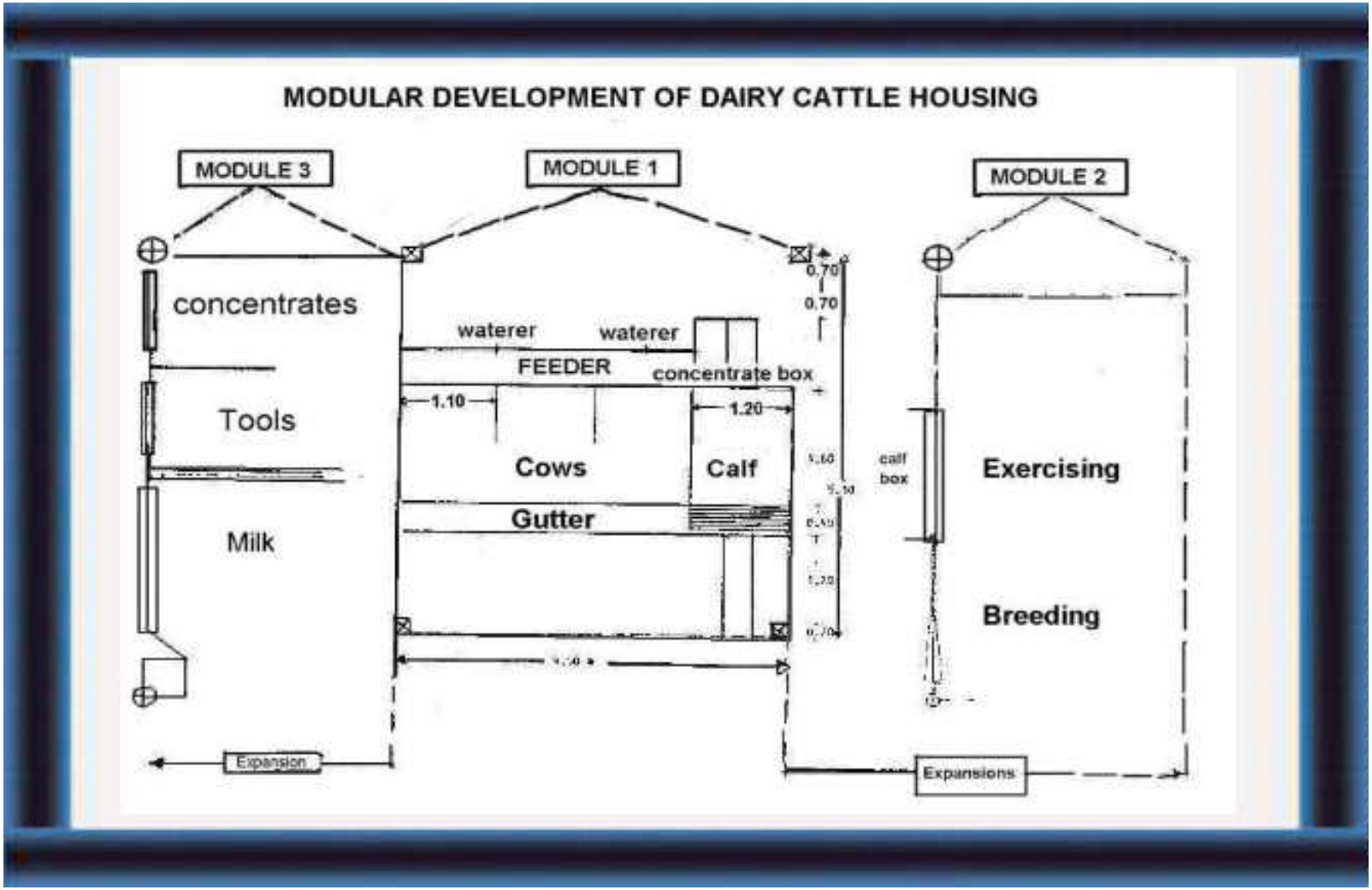
Modular approach proposed by FAO-RDDTTAP. (52-53)

- Module 1 comprises the living area for the cows, heifers and calves. This is constructed initially on a simple layout, according to the means of the smallholder.

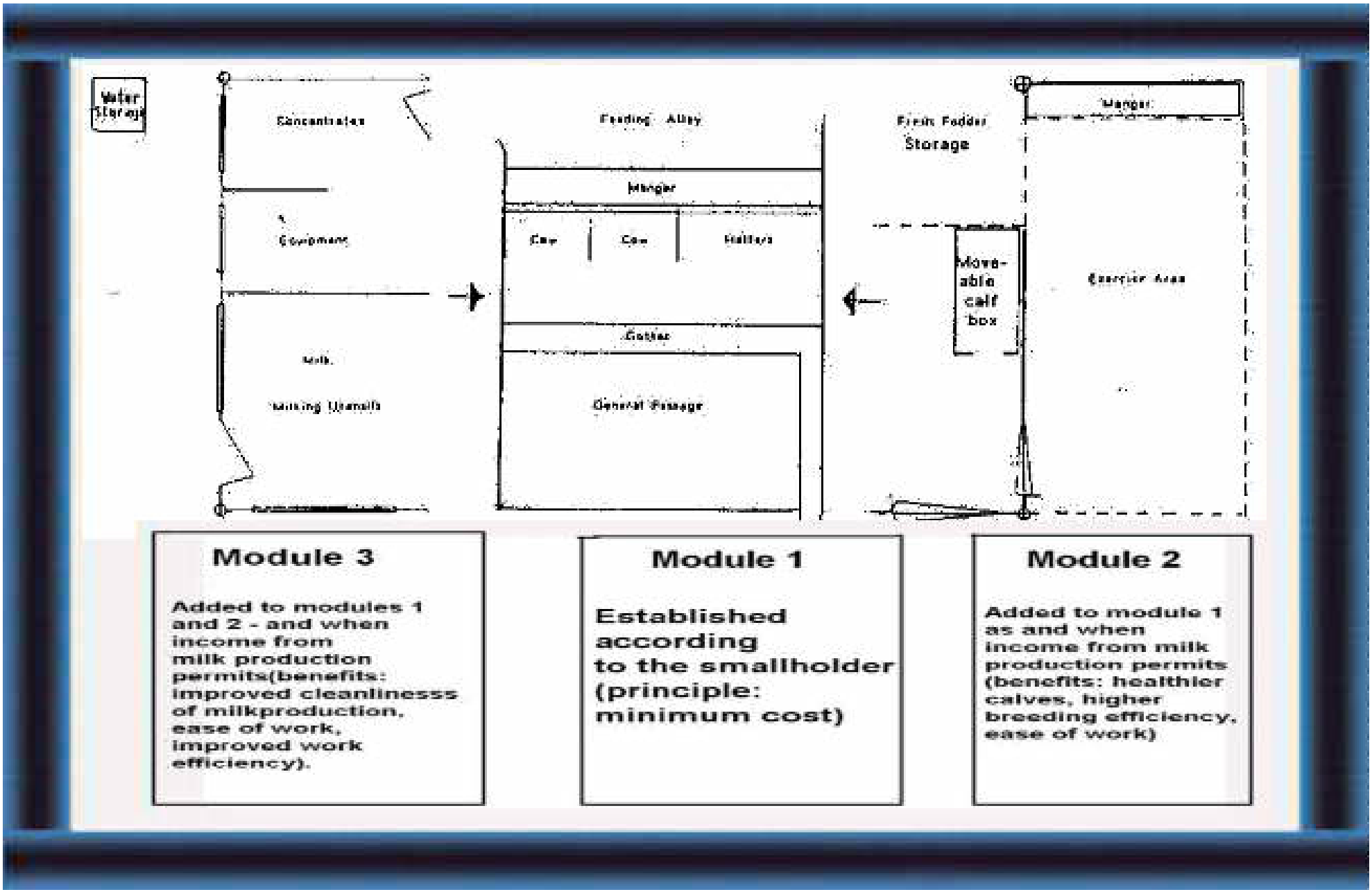
- Module 2 comprises a movable calf box, storage for fresh fodder and exercise area with an attached manger added on subsequently as and when income from milk production permits. This addition would bring addi-tional benefits from healthier calves, higher breeding efficiency and ease of work.

- Module 3 comprises separate areas for concentrate feeds, farm equipment, water storage, and milk and milk utensils. This is added on to Modules 1 and 2 as and when income from milk production permits. The additional benefits would be from improved cleanliness of milk, ease of work and improved work efficiency.

52 You could build your cattle shed in 3 stages (modular approach):


MODULAR DEVELOPMENT OF DAIRY CATTLE HOUSING
MODULE 3
MODULE 1
MODULE 2
concentrates
Tools
Milk
waterer
waterer
FEEDER
concentrate box
1.10
1.20
Cows
Calf
Gutter
0.70
0.70
calf box
Exercising
Breeding
Expansion
Expansions

53


Water Storage
Concentrates
Equipment
Milk
Milking Utensils
Feeding Alley
Manger
Cow
Cow
Heifers
Gutter
General Passage
Manger
Fresh Fodder Storage
Move-able calf box
Exercise Area
Module 3
Added to modules 1 and 2 - and when income from milk production permits(benefits: improved cleanlinesss of milkproduction, ease of work, improved work efficiency).
Module 1
Established according to the smallholder (principle: minimum cost)
Module 2
Added to module 1 as and when income from milk production permits (benefits: healthier calves, higher breeding efficiency, ease of work)

The standing

The standing is the area allowed for cows and heifers. (54)

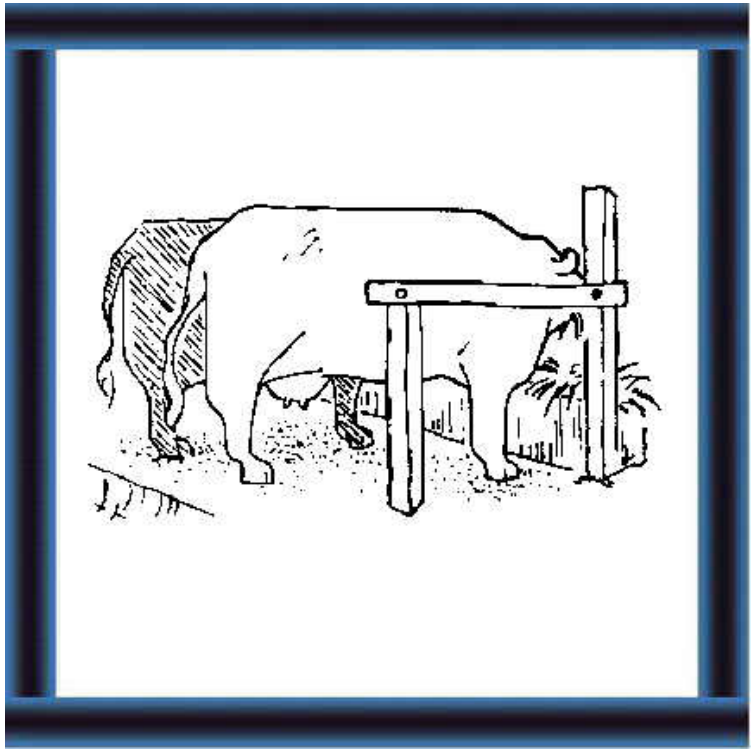
The main aspects to be considered are the floor area, type of floor and slope, partitioning and tethering arrangements.

Floor area

The floor area on the standing allowed for each cow/heifer depends on the size of the animal. The principle is to provide adequate space for the animal to lie down in comfort and to get up without obstruction. At the same time the urine and dung should drop away from the animal, preferably into the gutter (dung channel). (55)

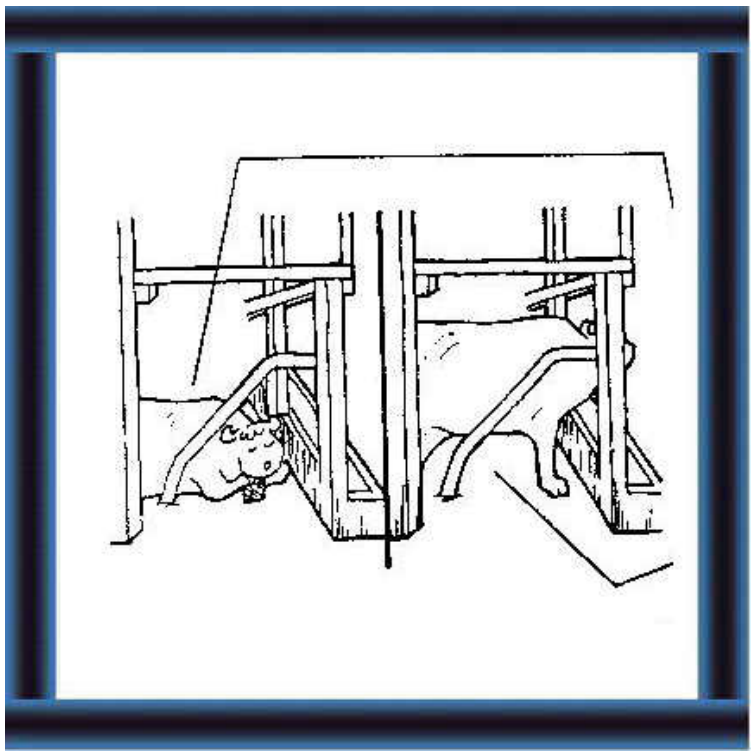
The standing area usually allowed for a crossbred dairy cow is about 1.60 m x 1.10 m (See Module 1). (56)

The area for the heifers can be reduced by changing the position of the gutter (See MLDC layout). (57)



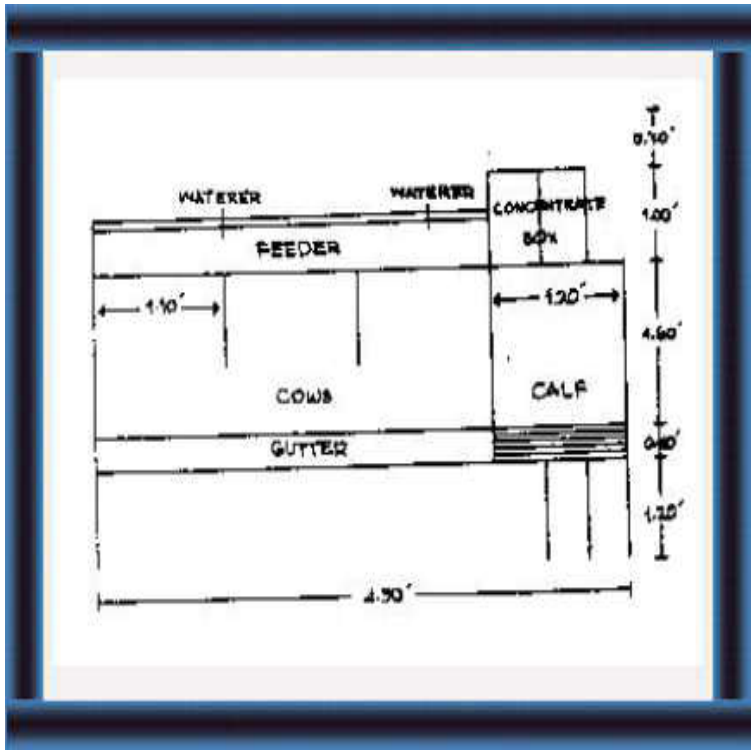
Standing

54 The standing is the area for your cows and heifers.

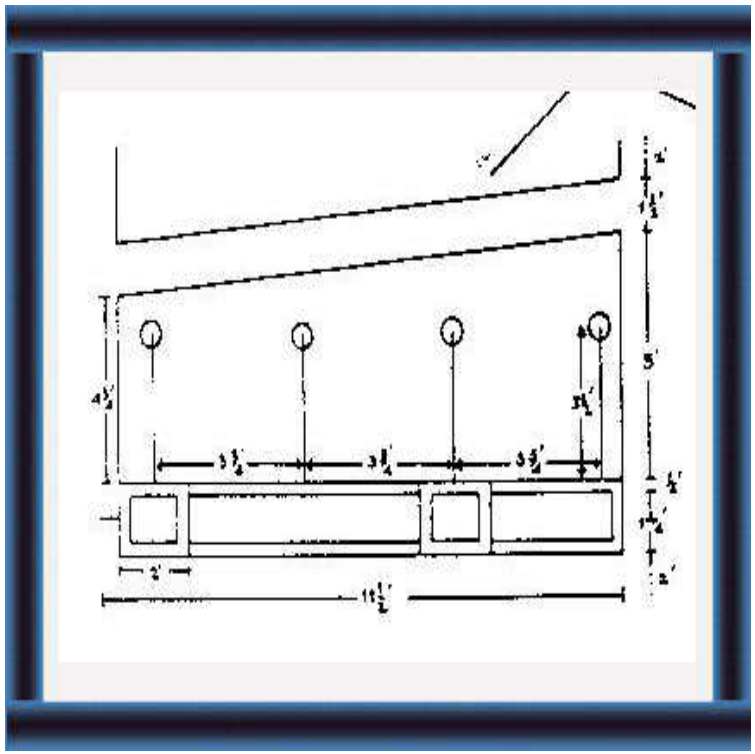


Floor area

55 Your animal should be able to lie down and get up **easily**.



56 A crossbred dairy cow needs about **1.60 m x 1.10 m**. (See Module 1 in 52-53 above)



57 **Heifers** need a **smaller area** and you can **angle** the **gutter**. (See 49 above)

Slightly larger areas are being recommended for buffaloes (2.25 m x 1.35 m). (58)

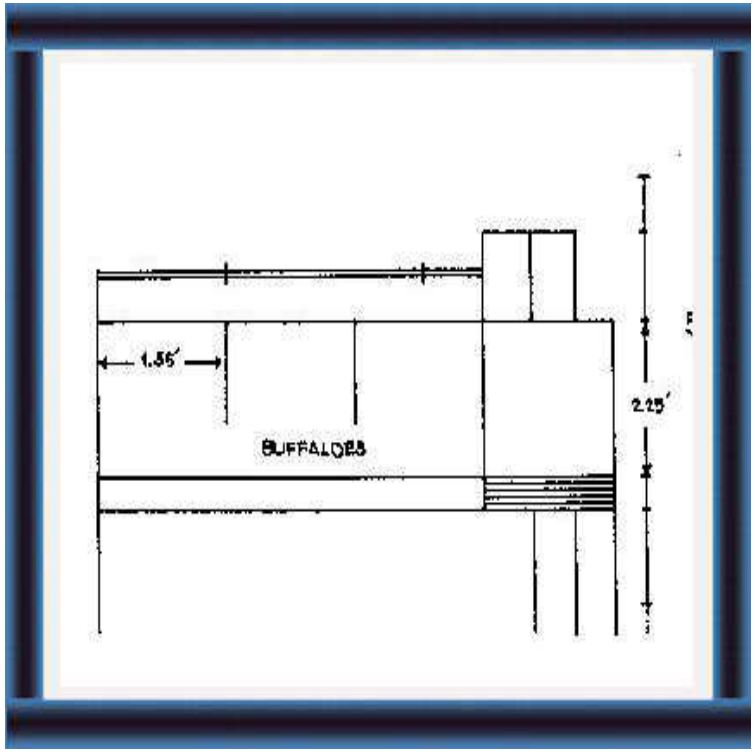
Type of floor and slope

The floor can be made of:

Rammed earth and gravel (59)

For a rammed earth and gravel floor, a slope of about 3 % or 1 in 30 (towards the gutter) will be required. (60)

The main advantage of a rammed earth and gravel floor is its low initial cost. However, it needs constant maintenance to prevent the appearance of uneven areas where pools of mud and urine will form. (61)

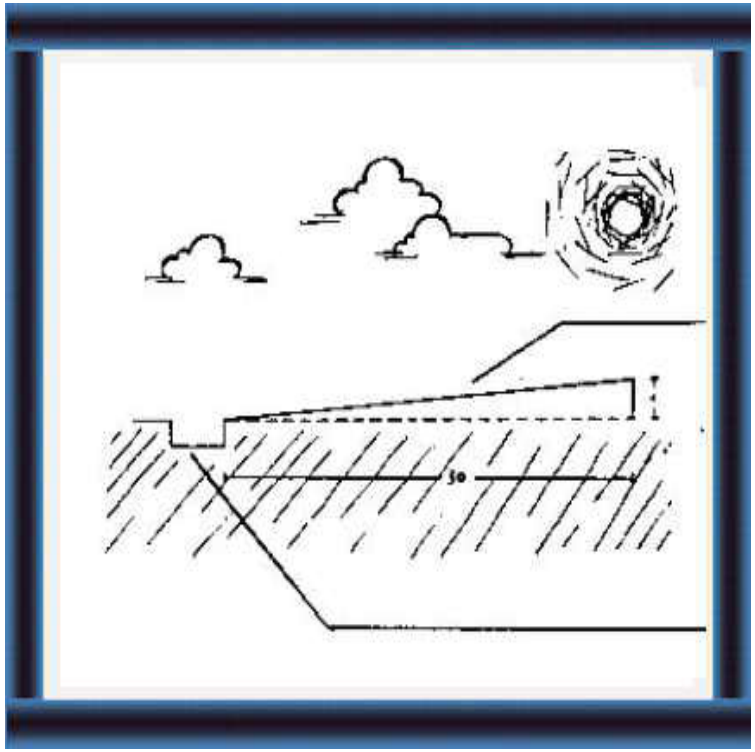


58 **Buffaloes** need a **larger area** - about **2.25 m x 1.35 m**.

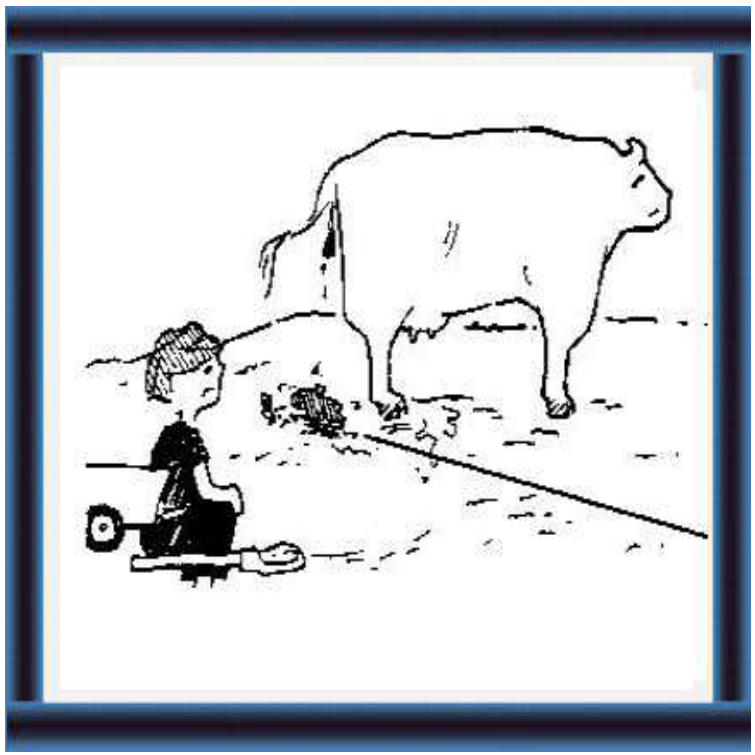
Type of floor and slope

Rammed earth and gravel

59 You can make the floor of rammed earth and gravel.



60 Make the slope **1 in 30** (3 %) **towards** the gutter.



61 This floor is **low cost** but:
- you must keep it **flat** (and sloping) to **prevent** pools of mud and urine

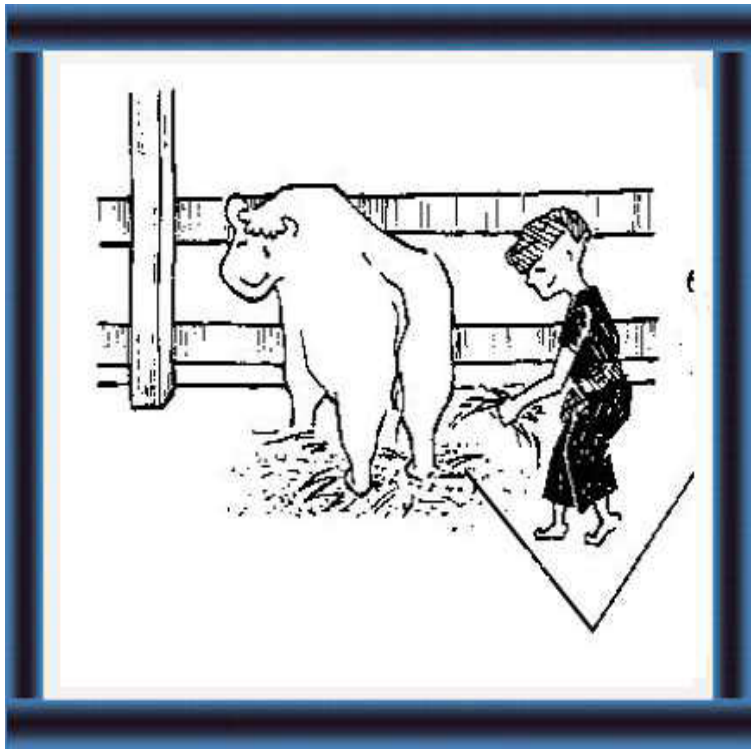
There are also difficulties in collecting all the urine for fertilizer or compost making because part of it will be absorbed into the floor. (62)

This can be partially overcome by having sufficient bedding e.g. saw dust, straw or left over roughage around the hind quarters of the animals. (63)

Large pieces of rubble with the flat surface facing up

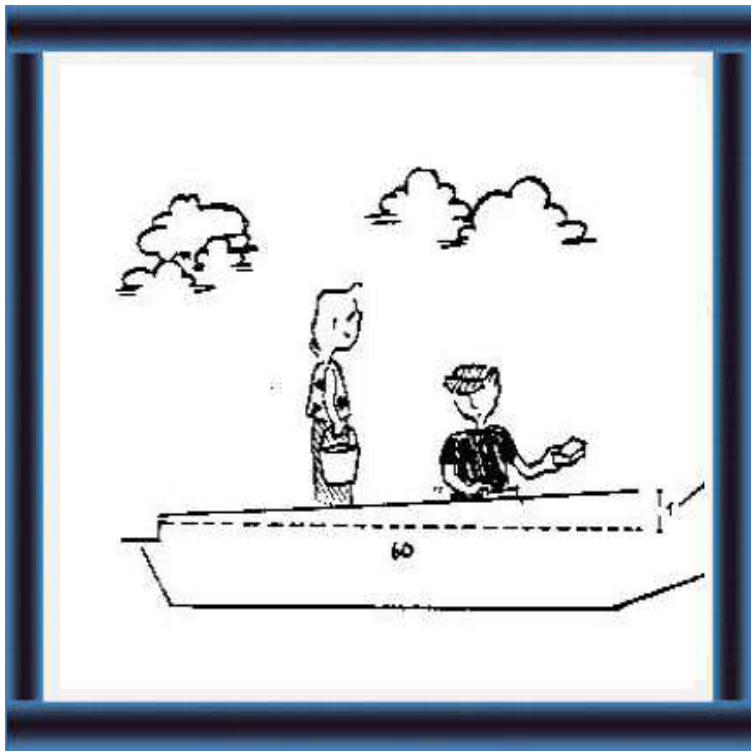
The rubble is laid on and bound together with a mixture of cement and sand, e.g. 1:3. (64-67)

62
- it is **difficult** to collect urine for compost manure because it soaks into the floor.



63 You can help **soak up urine** by putting **bedding** (e.g. saw-dust, straw, left-over roughage) around the back of the animal.

Rubble and cement
64 You can make the floor of rubble and cement.



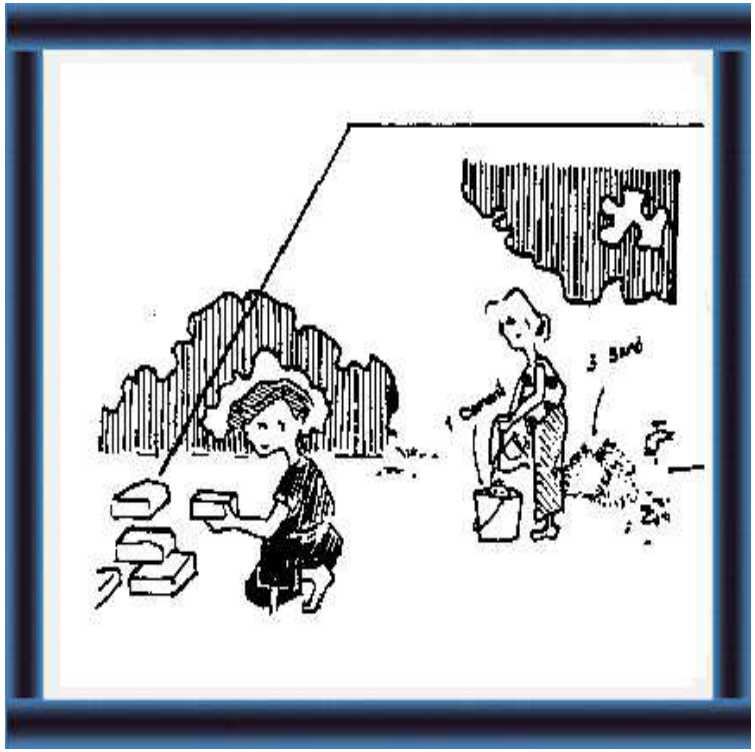
65 Make sure the site is **sloping** at least **1 in 60** (1.5 %) towards the gutter.

7.5 cm layer of concrete

Cement, sand and gravel are mixed in a suitable ratio, e.g. 1:3:3. (68-71)

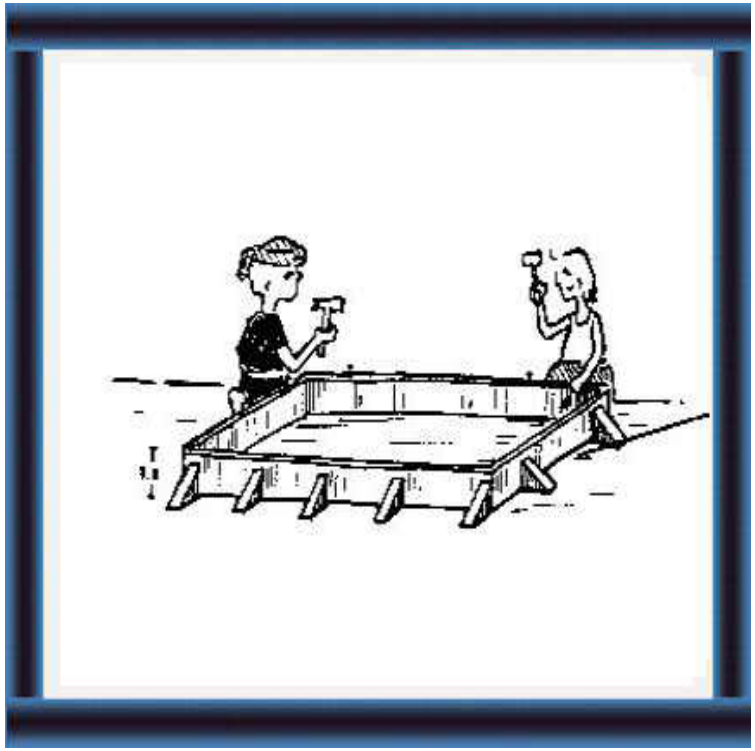
The slope can be reduced to about 1.5 % or 1 in 60 when large rubble on cement or concrete is used.

66 Lay down the rubble with the **flat side up**. Follow the



slope.
Mix **1 part** of **cement** with **3 parts** of **sand** and a **little water**.

67 Pour the sand/cement mixture between the rubble and make a **flat surface**.
Check the slope is still **at least 1 in 60**.

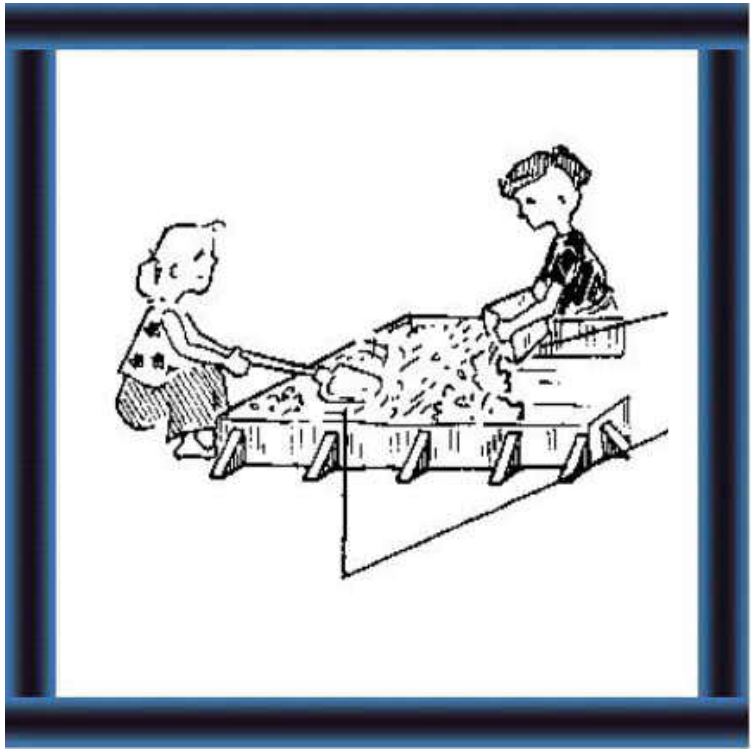


Concrete
68 You can make your floor of concrete.
Make a wooden frame **7.5 cm deep** with **strong supports**.
Remember: 1 in 60 slope

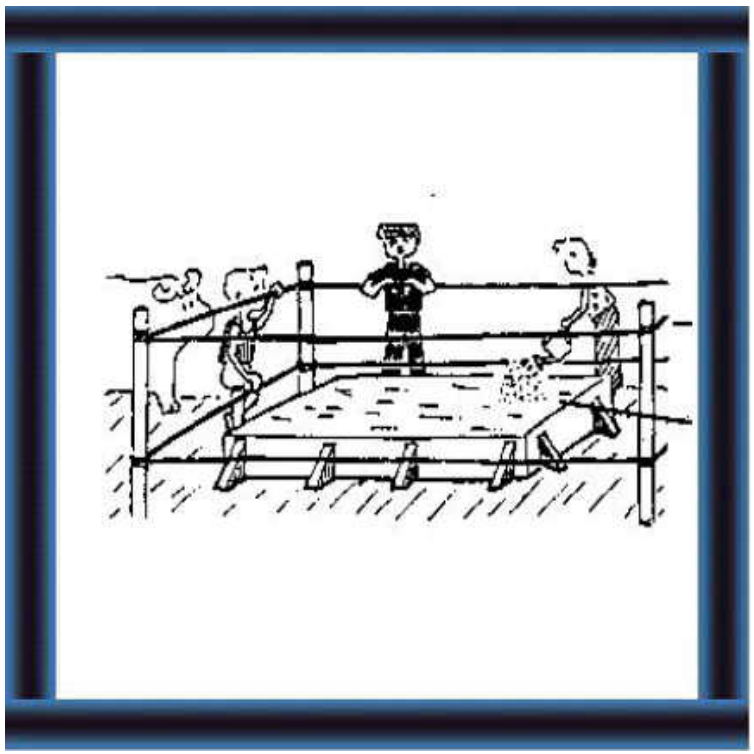
69 Mix **1 part** of **cement** with **3 parts** of sand, **3 parts** of **gravel** and a **little water**.

Wooden floors

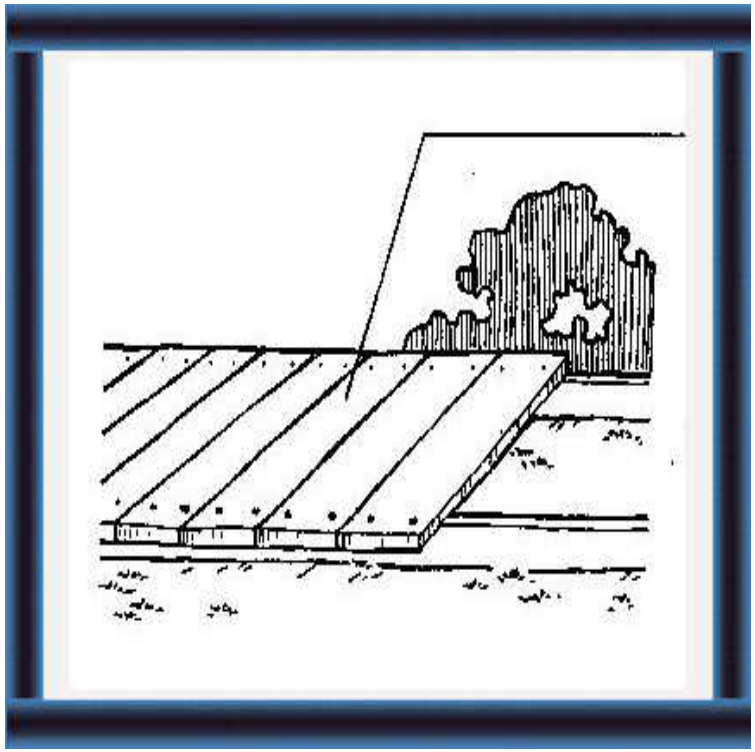
Wooden floors should be used only where the wood is of good quality and freely available. The costs of maintenance and repair increase as good quality wood becomes scarce. (72-73)



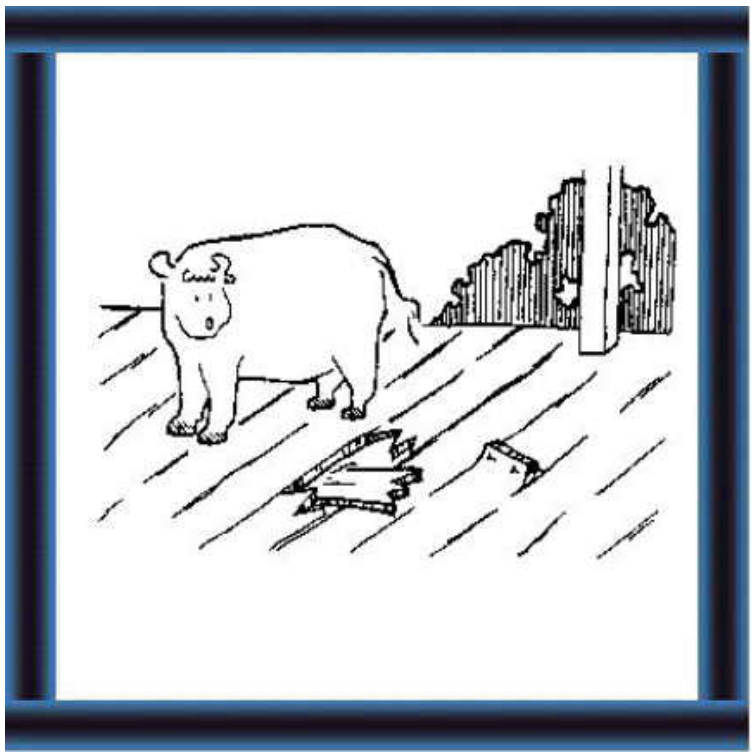
70 Pour the **concrete into the frame** with a bucket. Use a spade to **push down** the concrete and to make the surface flat.



71 Make a **fence round the floor** to protect it and **sprinkle water** for **2-3 days** until the concrete sets.



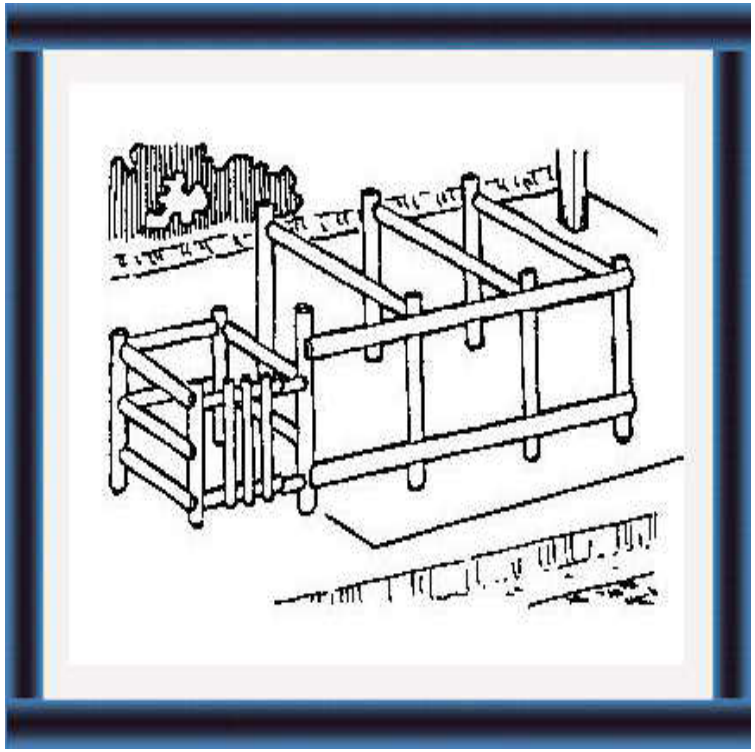
Wooden floor
72 You can make a wooden floor.



Use **good quality wood**.
73 Maintenance and repair costs are high for poor quality wood.

Partitioning

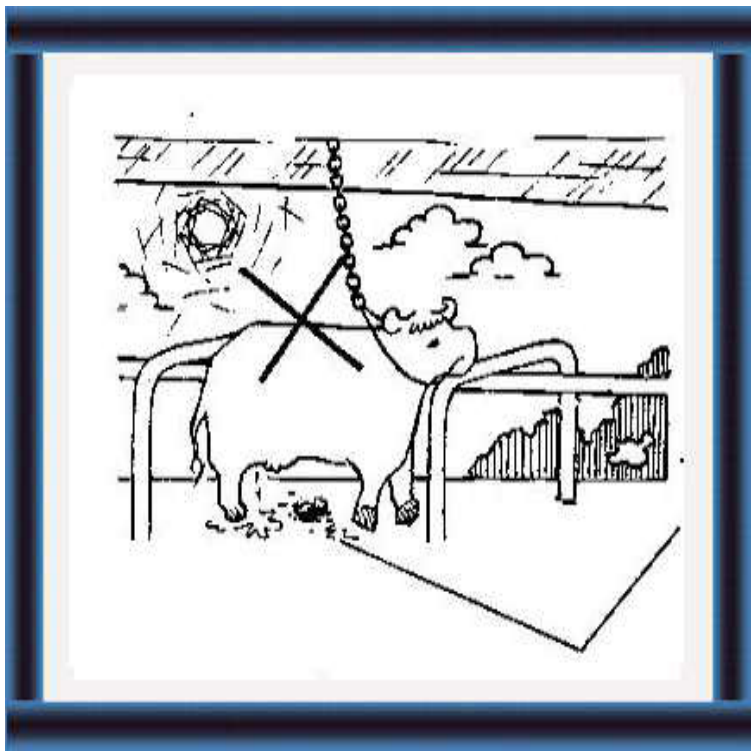
Partitioning within the shed keeps the calves separated from the adult cattle and also restricts the movement of the adult cattle across the standing. If the animals are allowed free movement across the standing, dung and urine will be dropped all over (may affect hygiene and make cleaning more difficult) and injuries may be caused e.g. by one animal trampling another's udder. (74-76)
The partitions can be made of wood available in the area or galvanized piping or a combination of the two. Initial costs and costs of maintenance should be taken into account in deciding what to use. (77)



Partitioning

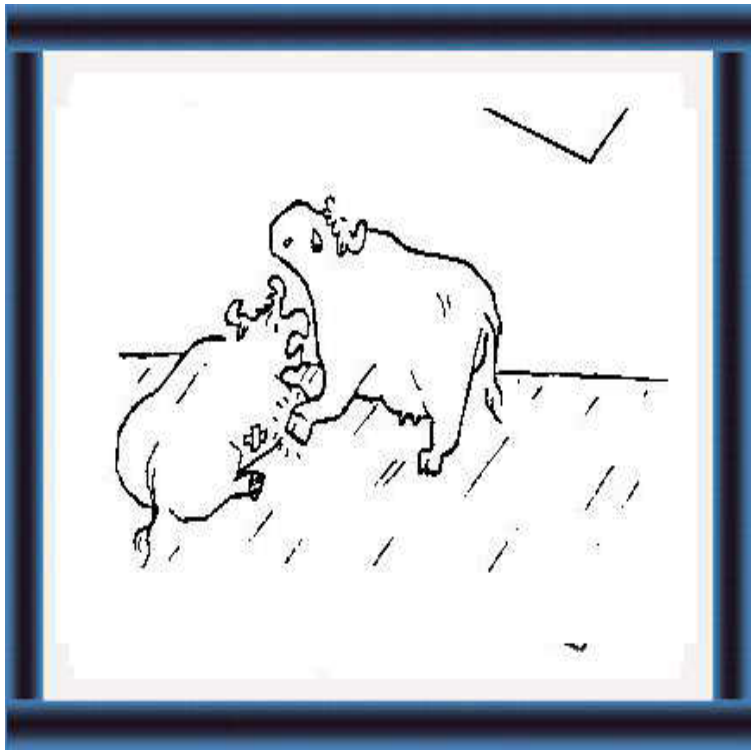
74 You need partitioning to:

- **separate** your calves from your adult cattle

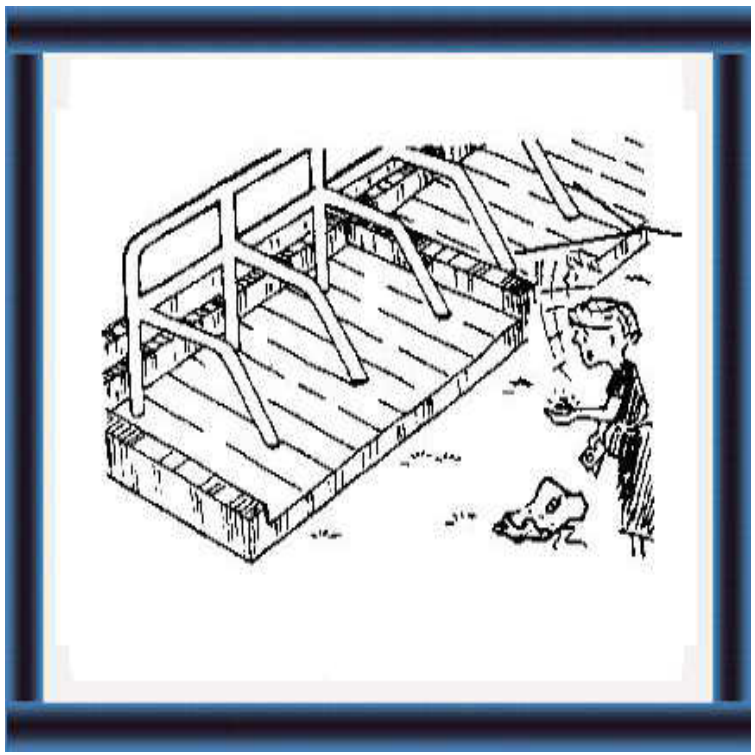


75

- **stop** your animals moving around and dropping dung and urine on the standing; **cleaning is difficult**.



76
- **stop** one animal trampling on another animal's udder; this may **cause injury** (and mastitis).



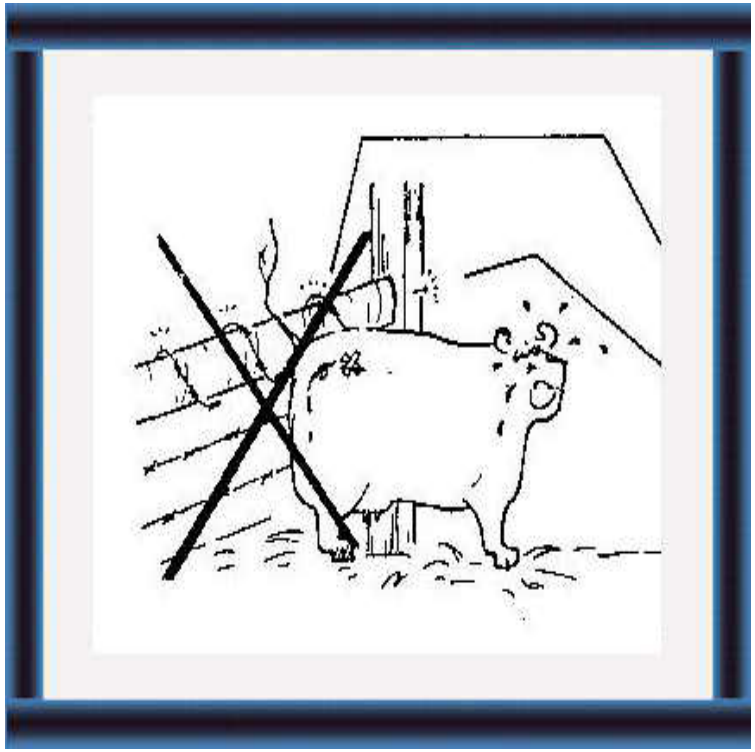
77 You can use **wood** or **galvanized piping** or both.
Plan carefully for **construction** and **maintenance costs**.

Barbed wire should never be used on partitions. Nails, or pointed or sharp edges of the material used should not be allowed to protrude because these can injure the animals. (78)

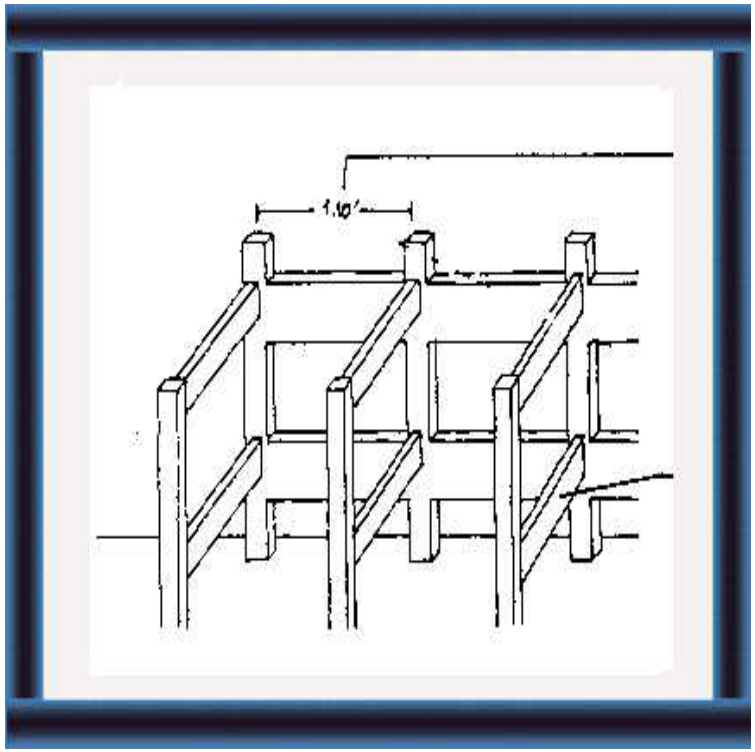
Partitions (dividers) between two adult animals are usually placed about 1.10 m apart and may extend only a distance of about 100.0 cm from the head of the standing to allow free access to the animal for milking etc. They may consist of two rafters (e.g. coconut), placed about 30.0 cm apart with the top one at a height of about 75.0 cm., fitted to two wooden posts, one at the head of standing and the other about 100.0 cm from it; or a 40.0 mm. diameter galvanized pipe fitted to a wooden or galvanized post at the head end, and bent about 100.0 cm away so that the other end can be buried in the standing. (79-80)

Tethering arrangements

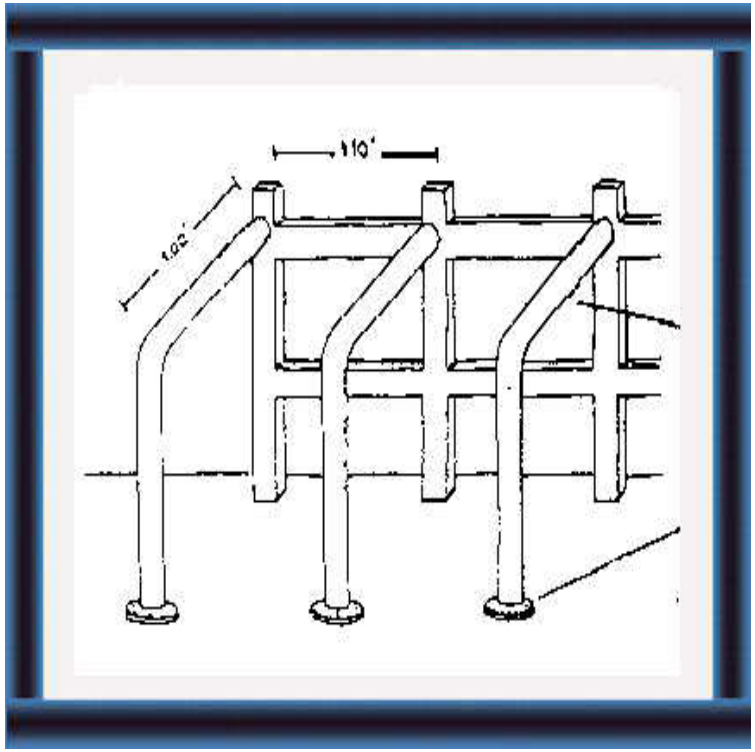
The simplest tethering arrangement is to tie the animal by its neck to a wooden post erected on the floor, using a coir (coconut fibre) rope. However, to prevent injuries to the animals and also to restrict its movements various improvements have been made. (81)



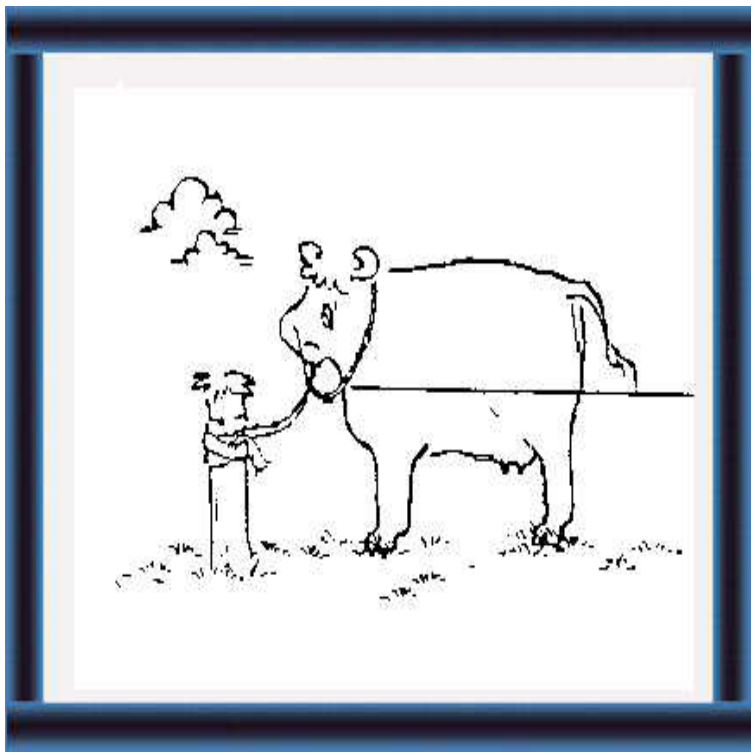
78 **Never**
- use barb wire
- leave nails sticking out or pointed edges.
These can **injure your animal**.



79 For adult animals, place **wooden partitions** about **1.10 m apart** with a **length of 1.00 m** - so you can **easily** get to your cow for milking



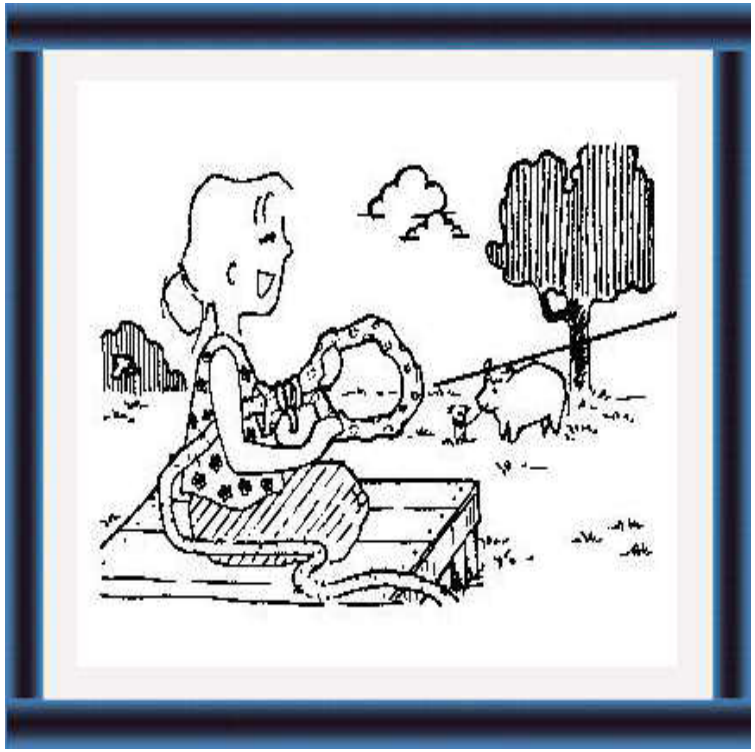
80 You can also use **40 mm diameter galvanized piping**.
Bend at 1.00 m and bury the bottom in the standing.



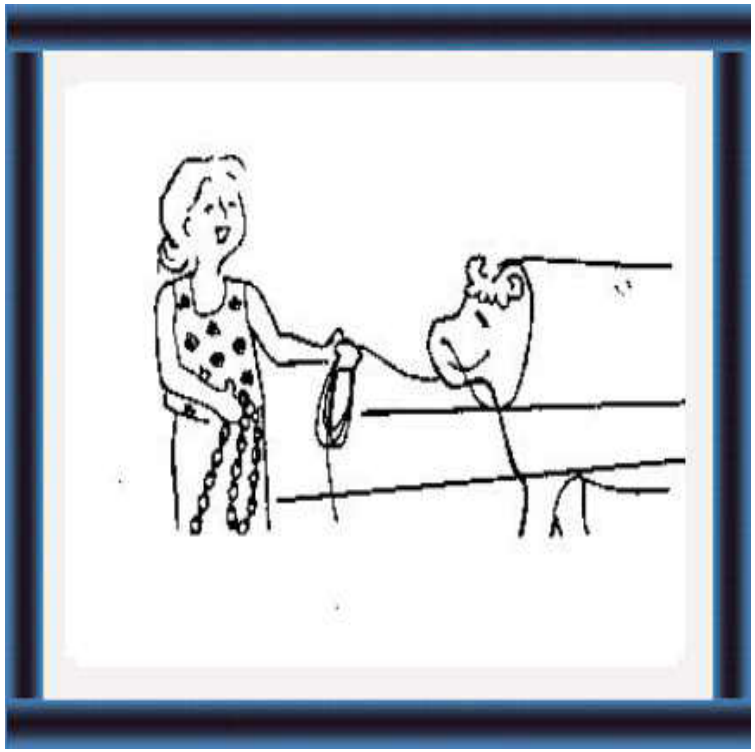
Tethering
81 It is very easy to use a **coconut fibre (coir) rope** tied to a post.
But your animal can get injured by the rope.

The rope itself can be lined on the outside with a cotton cloth and a girdle placed round the animal's neck. Ordinary coir rope is then used to connect this girdle to a post or other stay. The coir can be replaced by more durable and smooth material e.g. nylon or an iron chain. (82-83)

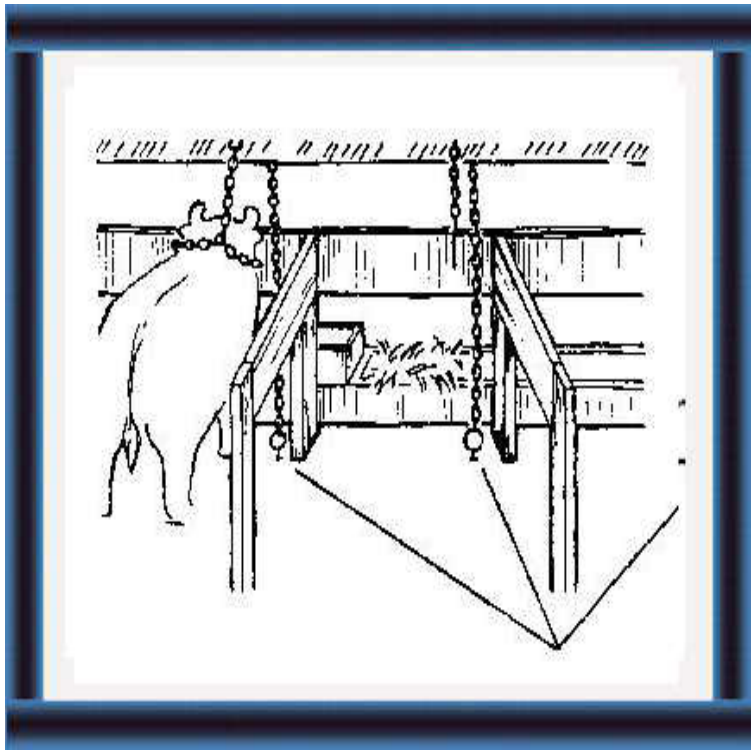
The stay for tying each animal may be an iron ring fixed to the floor close to the manger halfway between two partitions. Alternatively, two rings may be fixed for each animal, one close to each partition, so that the animal is more restricted to the centre of the standing. (84-85)



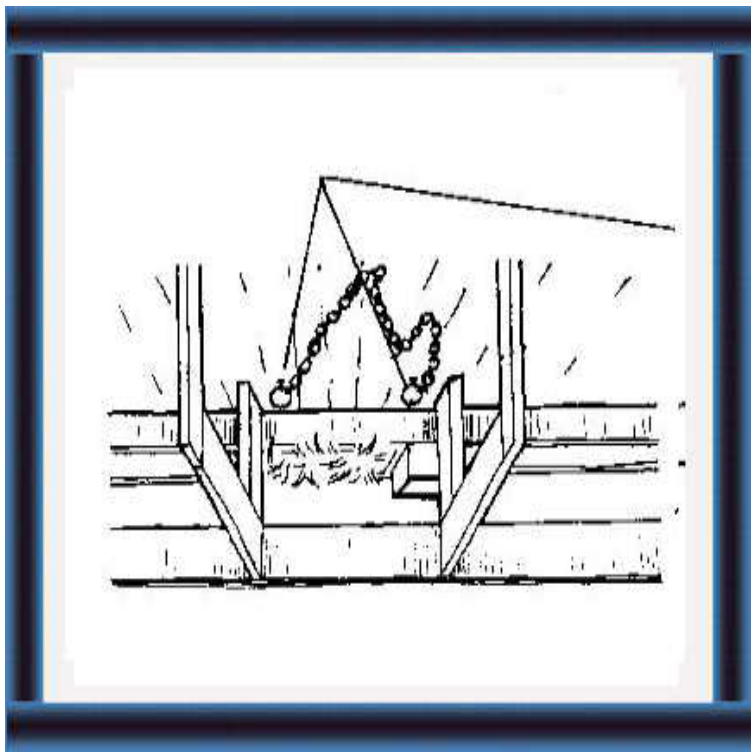
82 **Wrap** the rope with **cloth** and make a girdle to go around your animal's neck



83 or use a **strong smooth material** like **nylon** or an **iron chain**.



84 You can fix an **iron ring** (stay) to the floor near the manger between the partitions.

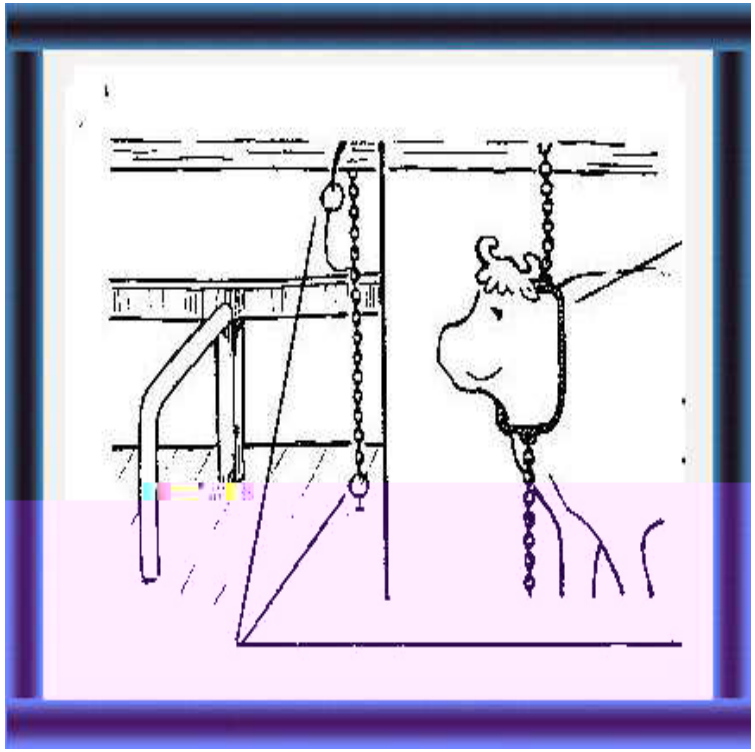


85 By fixing **two rings close to the partitions**, you can keep your animal **near the centre** of the standing.

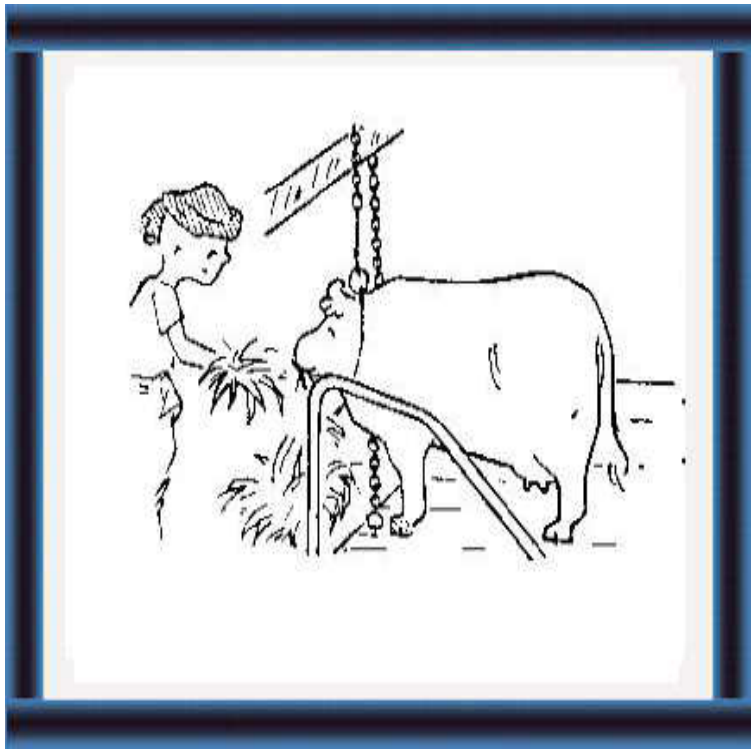
There are more elaborate tethering arrangements e.g. fixing an iron girdle round the neck which then gets attached by a chain to two points, one on the floor and the other above the animal. Most of the elaborations have been introduced with convenience of operation and the requirements of various feeding arrangement etc. as the basis. (86-87)

The gutter (also called drain or dung channel)

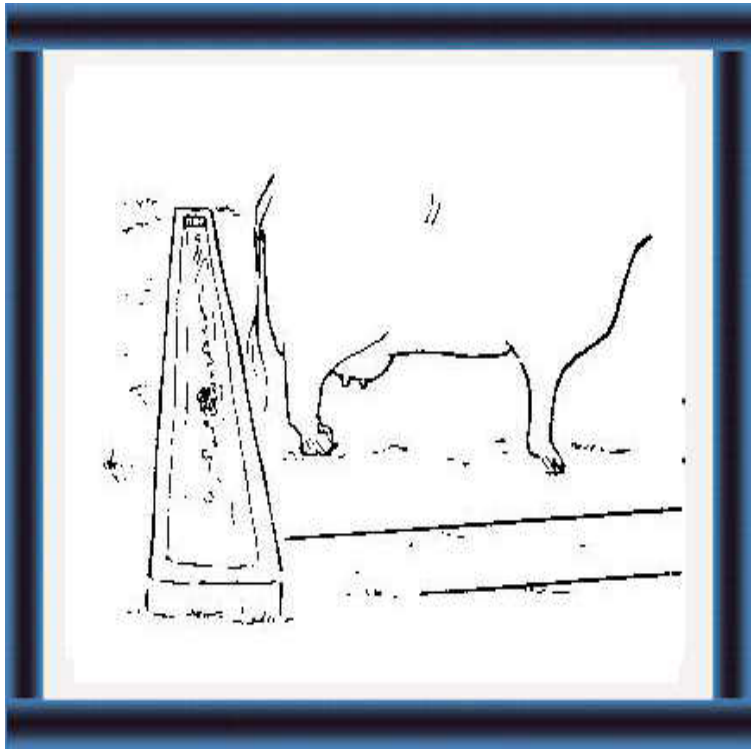
Even when the floor is of rammed earth and gravel, it is best to have the gutter made in rubble and cement or brick and cement. (88)
If the sides of the gutter are not strong, they will continuously erode into the gutter and proper maintenance of the floor of the standing will be impossible. By having the gutter finished smooth with cement and sand, cleaning will be convenient and the dung and urine can easily be led into a urine pit or a bio-gas digester outside the shed. (89-91)



86 This tether has an **iron girdle** and a **chain** fixed to the **floor and above** the animal.

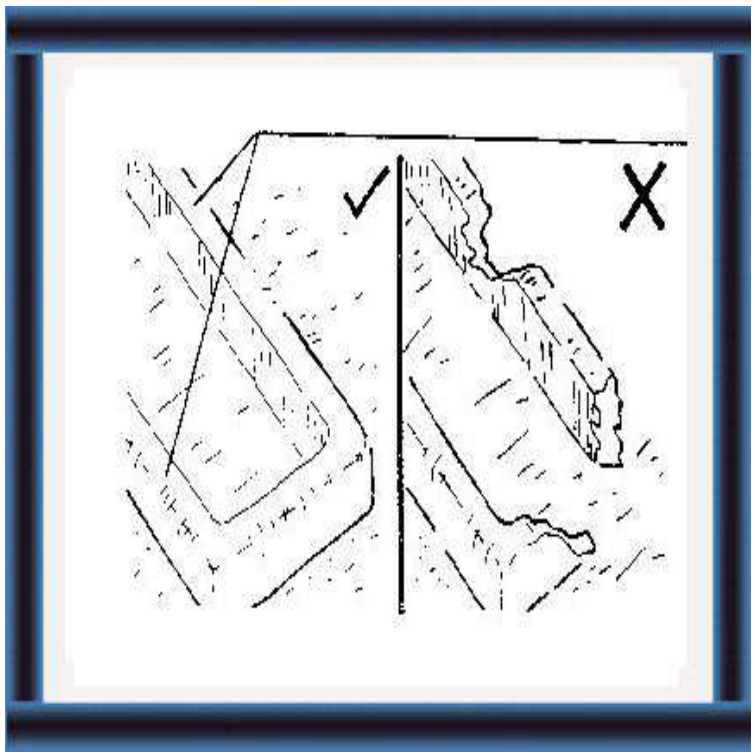


87 Choose a design which is:
- **easy** to use
- **suitable** for your feeding arrangements.



Gutter (Drain or Dung Channel)

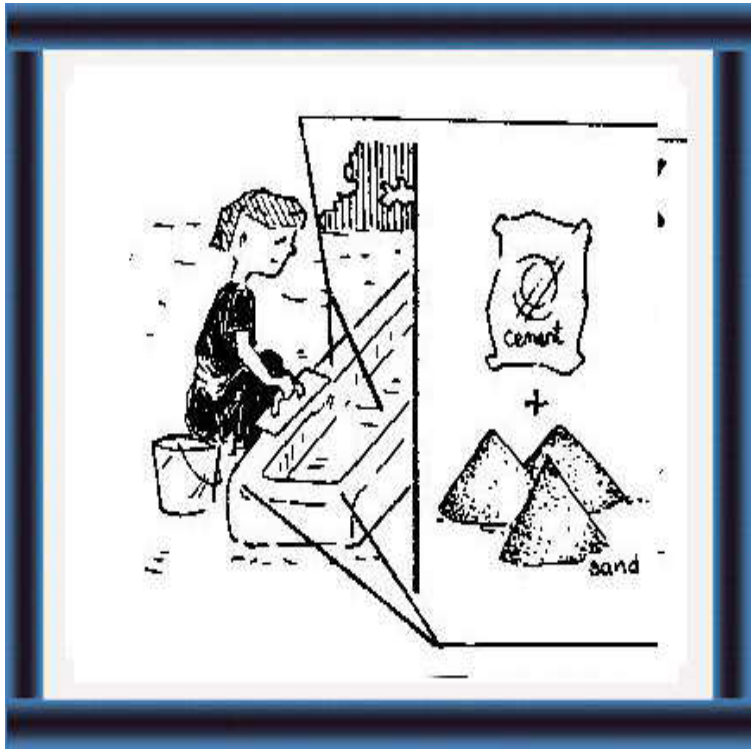
88 **Always** make your **gutter** of **rubble** (or brick) and **cement**, even if your floor is rammed earth and gravel.



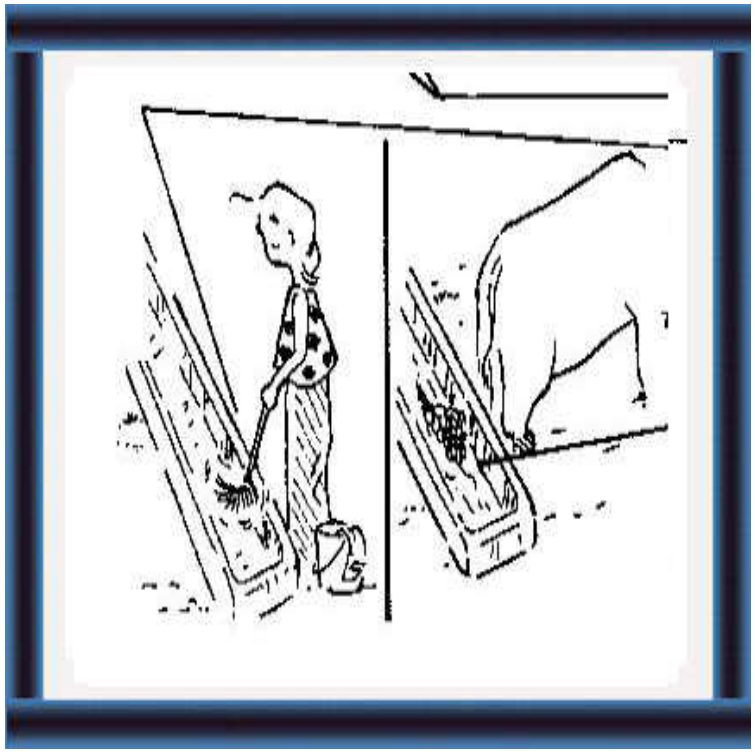
89 This makes sure the sides of the gutter are **strong** for **good maintenance** of the floor.

The gutter may be about 15.0 cm deep at the start, 40.0 cm wide with a slope of about of 2.5 % or 1 in 40 lengthwise. Gutters of 30.0 cm depth are also being used to prevent animals standing in the gutter and dropping dung and urine on the passage.

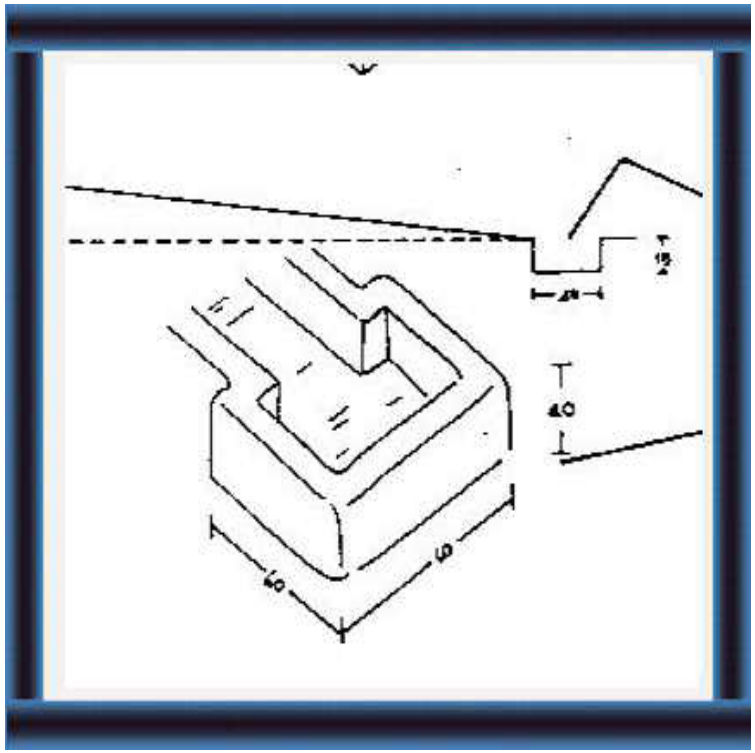
If cement rendering is used, the edges may be rounded to facilitate cleaning. The gutter may lead to a urine pit about 60.0 cm x 60.0 cm and 40.0 cm deep or to a bio-gas digester. (92-93)



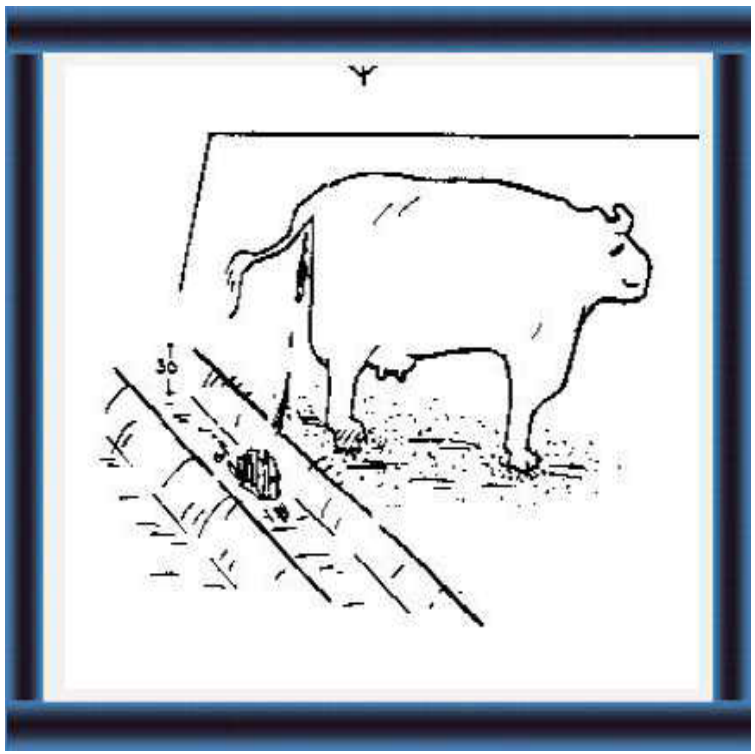
90 Make **walls** and **bottom** of the **gutter smooth** with a sand/ cement mixture and **round** the **edges**



91 so the gutter is **easy to clean** and **carries urine** and **dung easily** to a urine pit or bio-gas digester.



92 The gutter can be about **15 cm deep**, **40 cm wide** with a **slope of 1 in 40** (2.5 %).
It can lead to a **urine pit** (60 cm x 60 cm x 40 cm deep) or a **bio-gas digester**.



93 Some farmers use **30 cm deep gutters** to **prevent** animals:
- standing in the gutter
- dropping dung and urine on the standing.

The feeder (also called the manger)

The floor of the feeder can be made with rammed earth, rubble on cement or cement concrete. (94)

In its simplest form, the feeder is an area separated out from the standing with a wooden plank. There is a slope away from the animal of about 2.5 % or 1 in 40. (95).

The disadvantages of this arrangement are: (96)

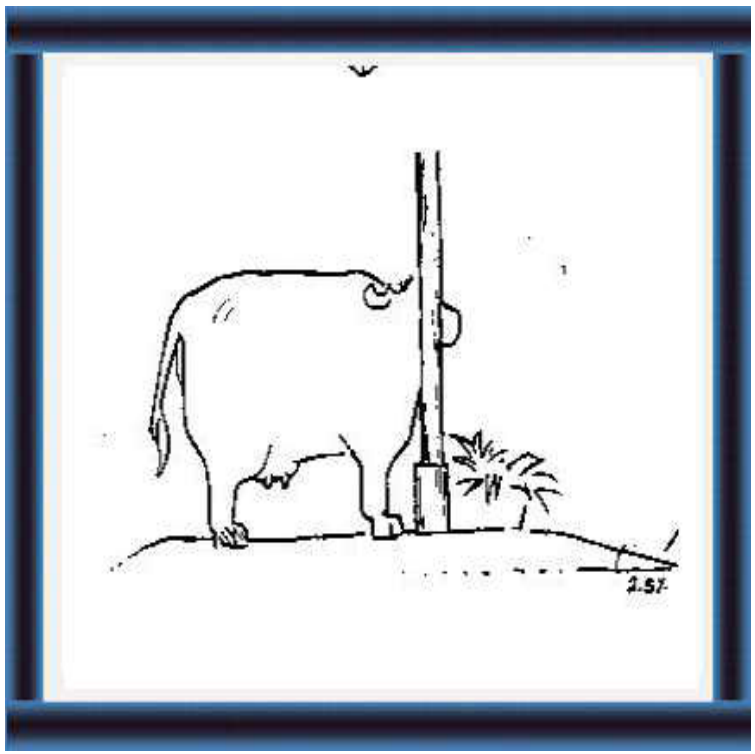
- the animal cannot pick up some of the feed which may thus get wasted;

- a container has to be used for feeding concentrates.

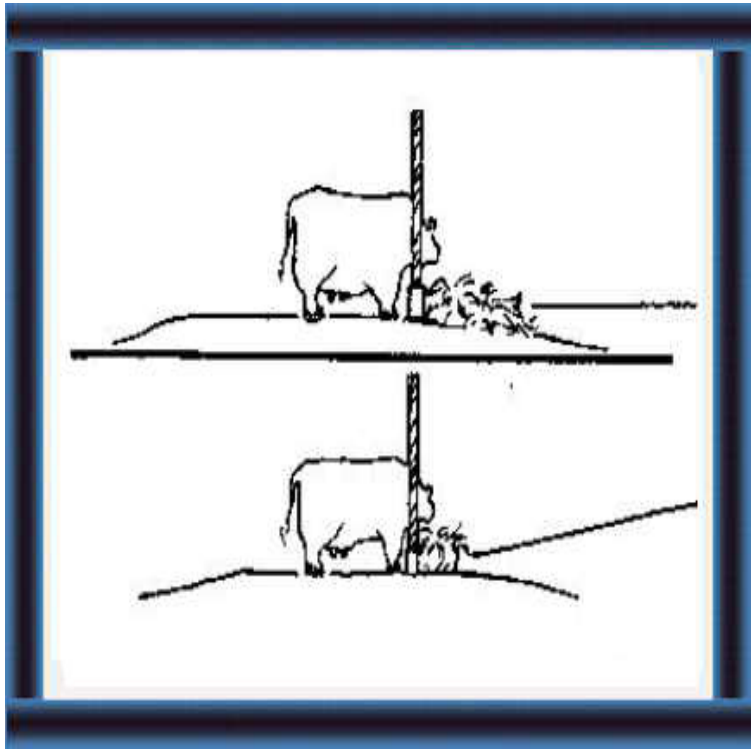
The feeder may be made of wooden planks, bamboo poles, bamboo strips or galvanized sheets. A metal barrel cut into two may also be used as a feeder. This will corrode rapidly if used for silage feeding. (97-98)

Feeder (or manger)

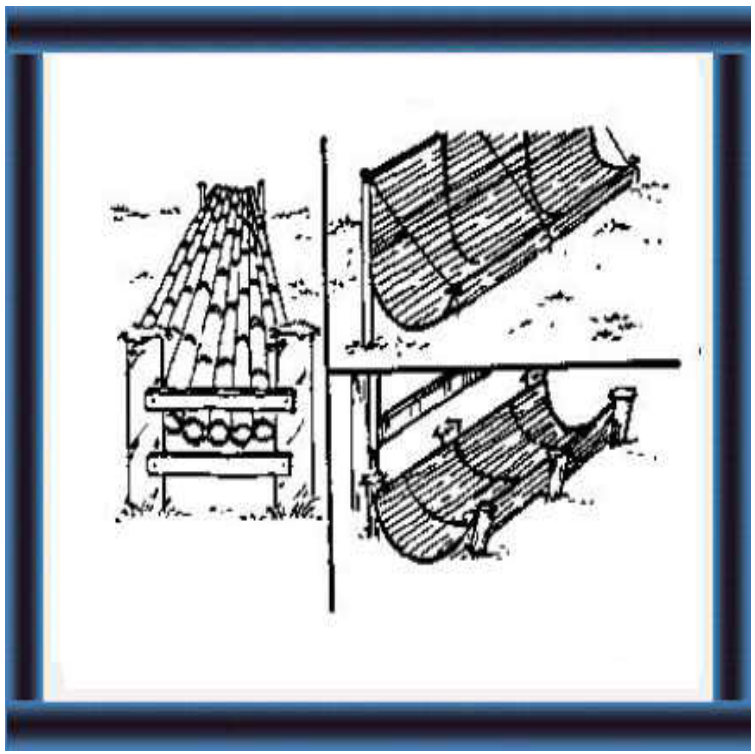
94 You can make the **floor** of the feeder of:
- rammed earth
- rubble/cement or
- concrete.



95 The floor of the feeder should **slope away** from the animal **1 in 40** (2.5 %)
but this simple design has **problems**:



96
- your animal **cannot pick** up some of the **feed** and it is **wasted**
- you need a **container** for **concentrates**.

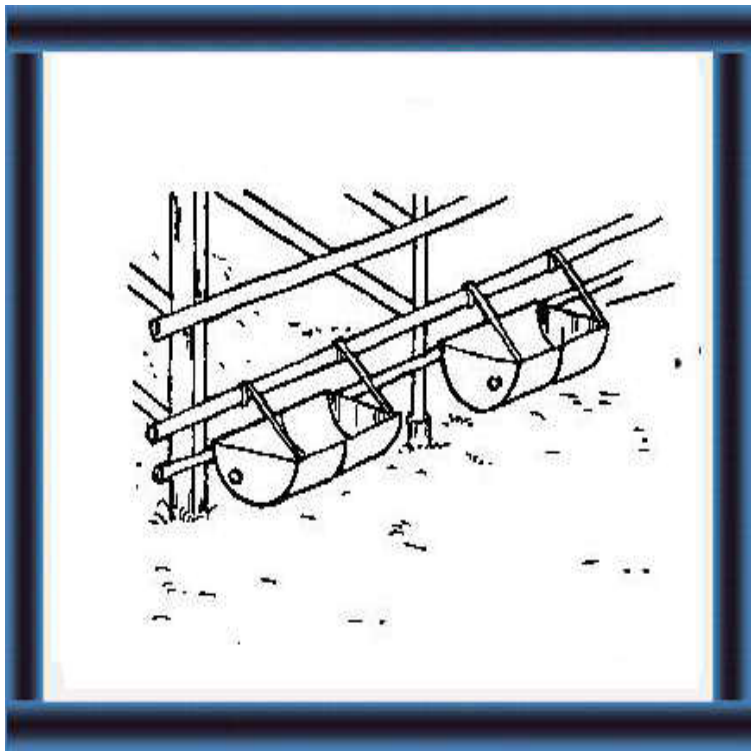


97 You can make the feeder of:
- wooden planks
- bamboo poles
- bamboo strips
- galvanized sheets

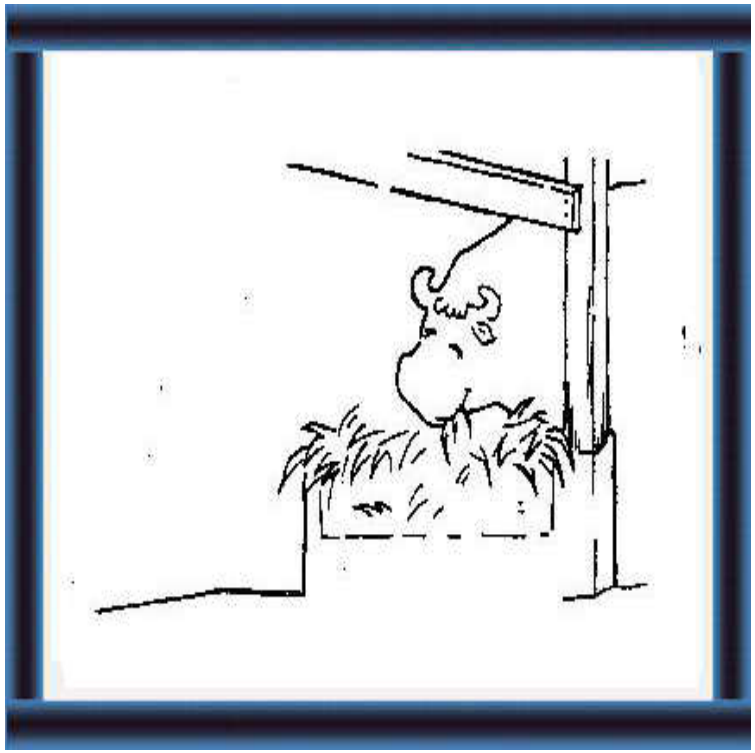
When constructing feeders with brick and cement, a rule to remember is that: "The higher the bottom of the trough, the further the animal is able to reach into it to feed." (99)

A wooden shaft or galvanized piping may be fitted at a height of 90.0 cm from the ground and over the wooden partition (head rail) to prevent the animal attempting to get into the feeder area. (100)
The waterer

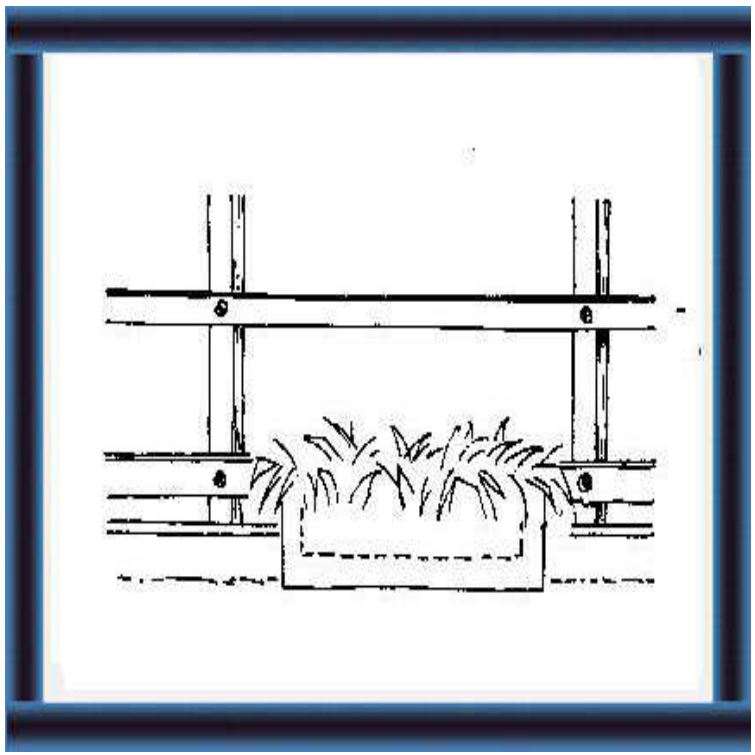
The simplest method is to supply water in buckets several times daily (at least three times a day). (101)



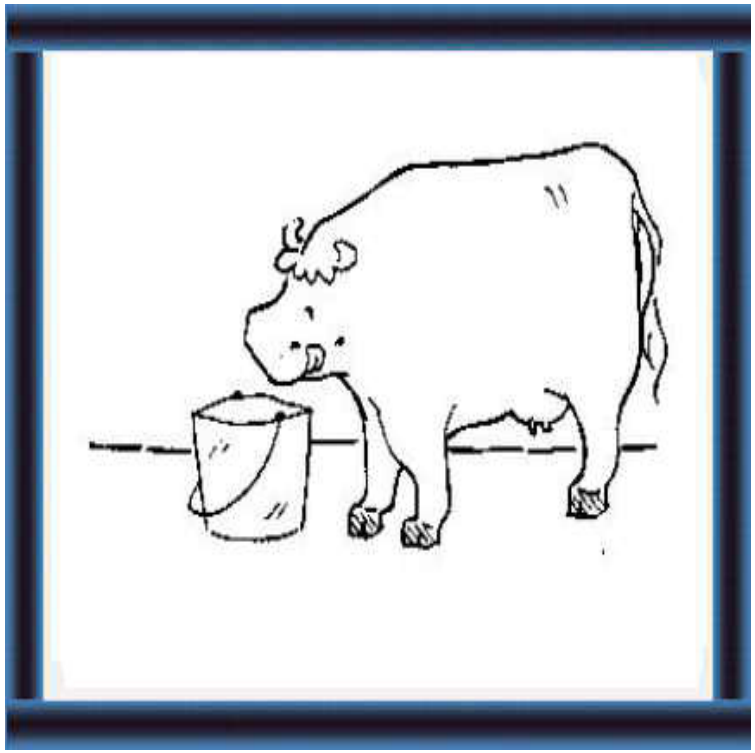
98 or metal barrels cut in 2
but these will **corrode rapidly** if used for silage feeding.



99 If you use brick and cement, **remember**:
- your animal can **reach further to feed** with a **high bottom**.



100 Fit a piece of **wood** or **galvanized pipe 90 cm above** the **floor** to **prevent** your animal getting into the feeding area.



Watering
101 It is **easy** to provide **water** in buckets **several times a day** (at least 3 times).

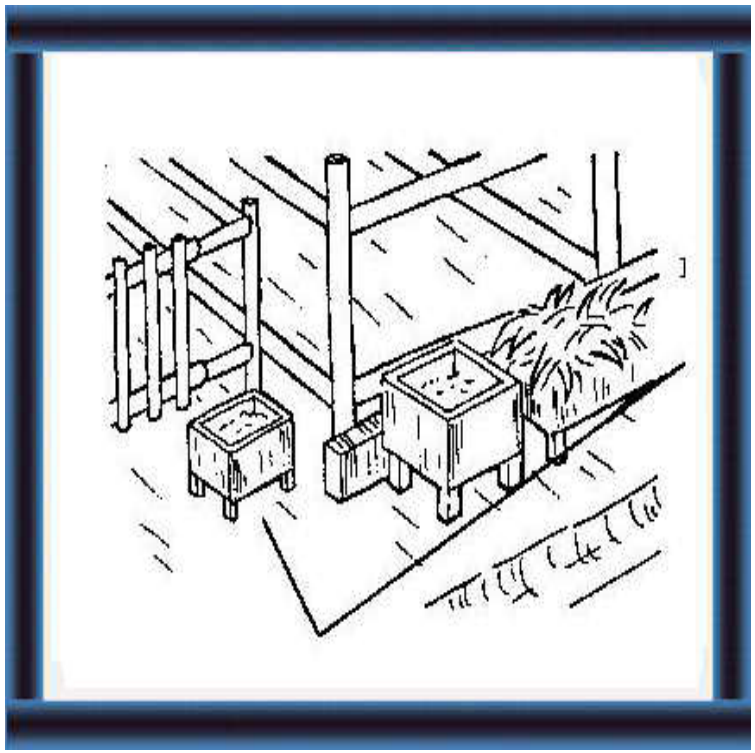
Water requirements are better met by making water available to the animals throughout the day by having a small compartment in a cement/concrete manger or having a small water tank (e.g. 60.0 cm x 50.0 cm and height 20.0 cm) constructed by the side of the manger. (See the MLDC arrangement providing one common tank to two animals 48-51). (102)

The roof

When the animals are to be housed in a basement of a human dwelling or under a stack of straw, the material to be used for the roof, roof arrangement etc. is already decided. But when a separate shed is constructed, the most appropriate and least expensive alternatives should be selected. Materials that can be used for the roof are many. The decision has to be made considering various aspects. (103)

Cadjans, straw, dried grasses and other seasoned leaves are being used in many areas. The supporting structure can also be very simple in these cases, which makes it quite economical initially. However, these materials need replacement at regular intervals of 1-3 years depending on the material used and

how skillfully the job is done. Therefore, maintenance is more costly than roofs made of clay tiles or galvanized sheets. (104-107)

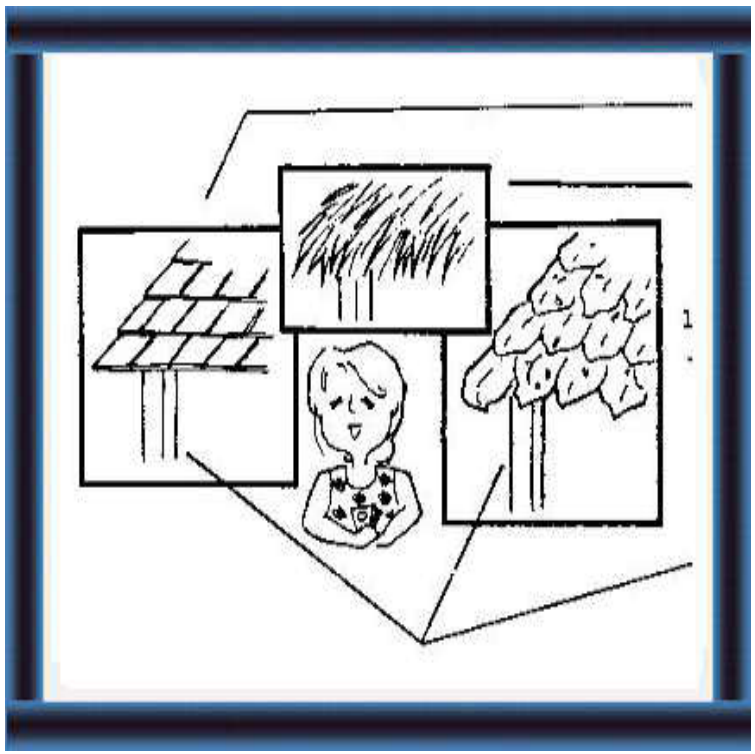


102 It is better to provide **water all day** by having a **water tank**

(e.g. cement/concrete 60 cm x 50 cm x 20 cm deep) **beside the manger** (1 tank for 2 animals).

Roof

103 When you choose roof materials, you should **think about**:
- purchase cost
- maintenance and repair costs.



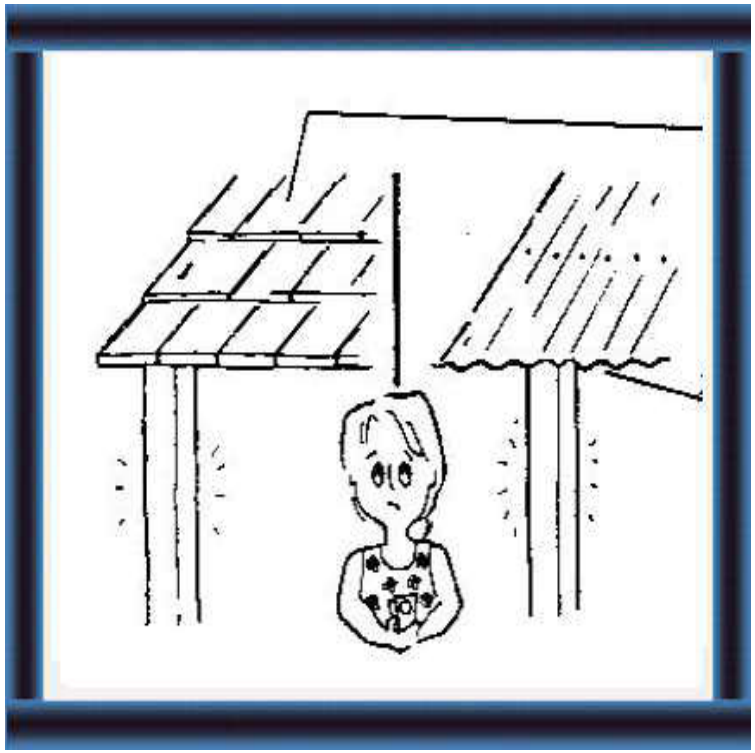
104 Coconut frond mats, straw and dried grasses, seasoned leaves need a **simple** support and are **cheap** to buy.

105 If the **materials** are **good** and the **labour skilful**, they may last **3 years**
so your **maintenance** and **repair costs** are **high**.

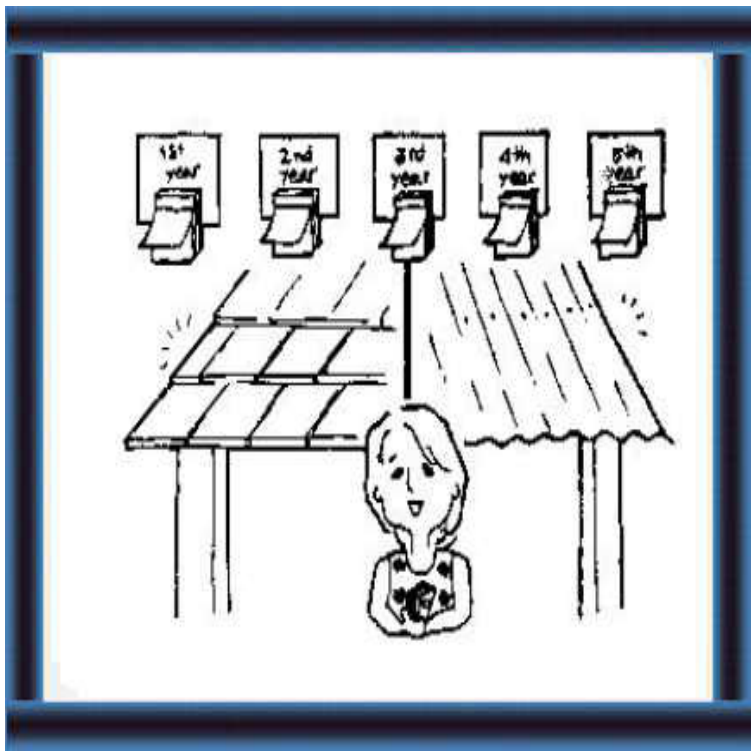
Roofs made of clay tiles or galvanized sheets are more expensive and, together with the strong supporting structure required especially for clay tiles, the initial expenditure can be extremely high. (108-109)

106 This is a large **straw** (thatched) roof

107 and its supporting structure of **wood** or **bamboo**.



108 **Clay tiles**, **galvanized sheets** need a **stronger support** and are **more expensive** to buy



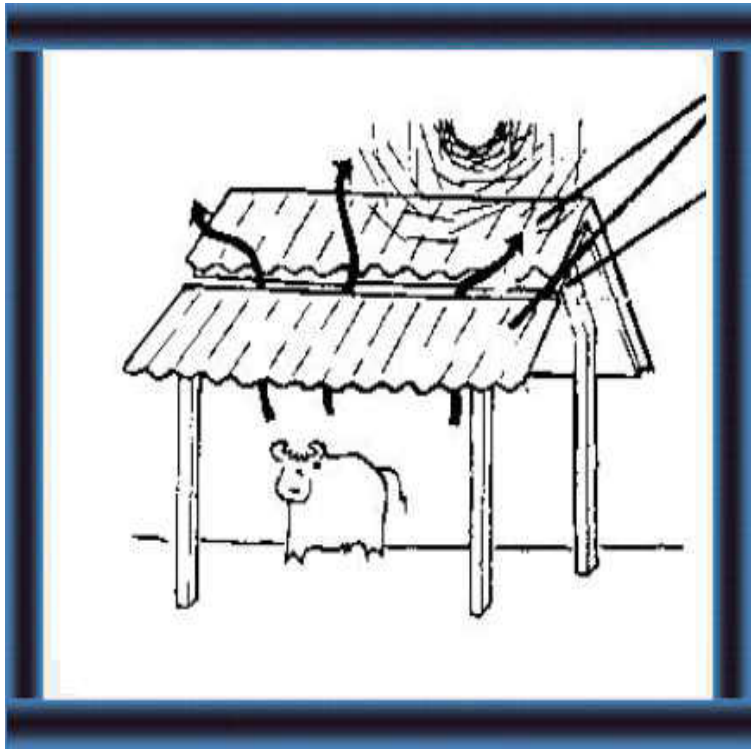
109 but they last **longer** so your maintenance and repair costs are **lower**.

In addition, in warm areas with bright sunlight and when there are no shade trees, the temperatures within the shed can be too high to be comfortable for dairy cattle. This effect can be overcome by having an overlay of cadjan or straw or by having a warm air outlet on the roof. The warm air outlet can be provided by having the roof at two levels. (110-112)

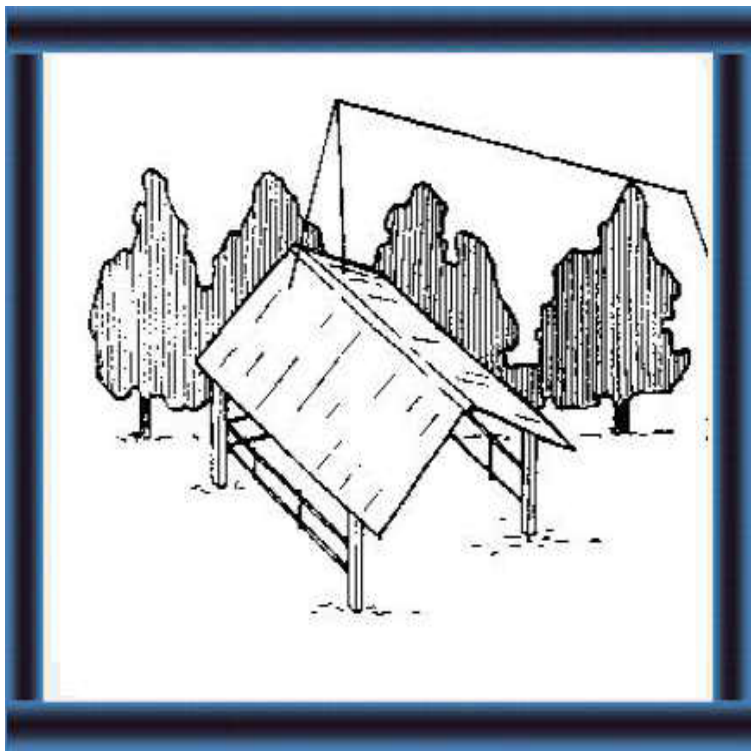
When an existing wall is used as one side of the shed, the lean-to roof (with a single slope) is the most convenient arrangement. When a separate shed is constructed away from other structures, a roof sloping in either direction from the centre would be best. (113, 116)

110 In tropical areas with little shade it can get **very hot** in the shed with a **tile** or **galvanized roof**.

111 You can keep the shed **cooler** by laying **mats**, **straw** or **leaves over** the tiles or galvanized sheets



112 or by having a **warm air outlet** e.g. with the roof on 2 levels.



113 If the shed is **separate** from other buildings, a **roof sloping** in **2 directions** away from the centre is best.

The height of the roof at the eaves should be adequate to allow easy access and ventilation, but should not exceed 2.40 m. Excess height can result in rain beating in and may make it easier for the roof to get blown off by severe blowing. (114)

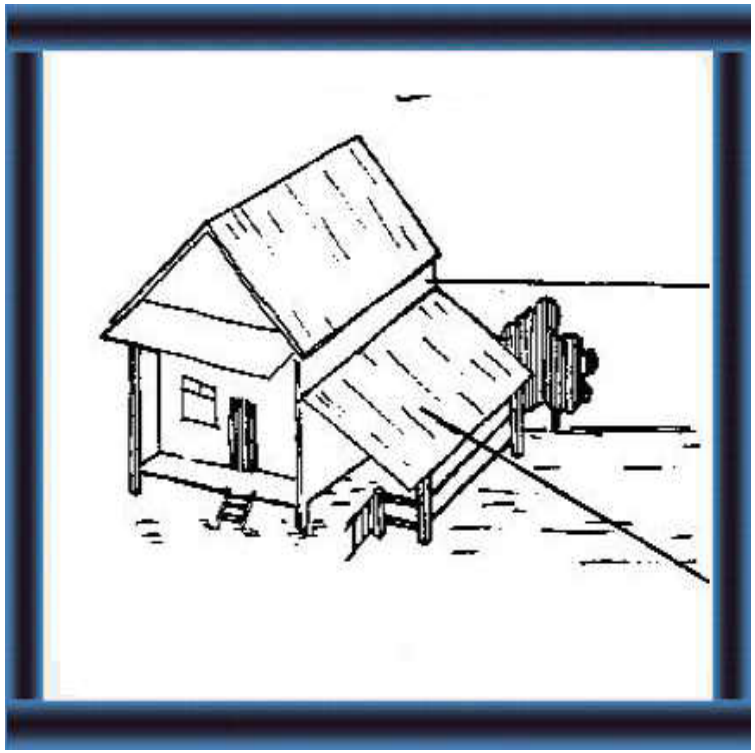
Having the roof extended about 60.0 cm beyond the floor area will also help in reducing the rain beating in. At the same time, curtains can be attached to the roof where necessary. (115)

Pillars and posts

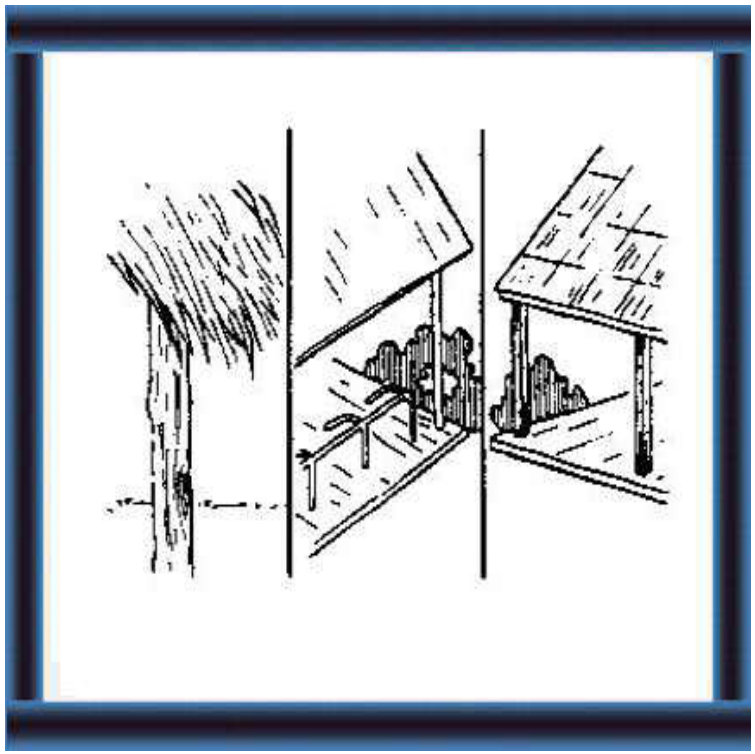
Pillars and posts within the shed can be made of wood, galvanized piping (of appropriate gauge and diameter), bricks and cement or cement concrete. When wood and or galvanized piping is used, durability can be improved by having the bottom of the pillar made of concrete up to a height of about 30.0 cm. (117-118)

114 Make the **height** at the **eaves enough** for **good ventilation** but not more than 2.40 m - **rain** may blow in and the roof may **blow off**.

115 Make the eaves of the roof **60 cm beyond** the floor area to **prevent rain** blowing in.
Fit curtains if necessary.



116 If you use the **wall** of **another building**, a **single slope roof** is best.

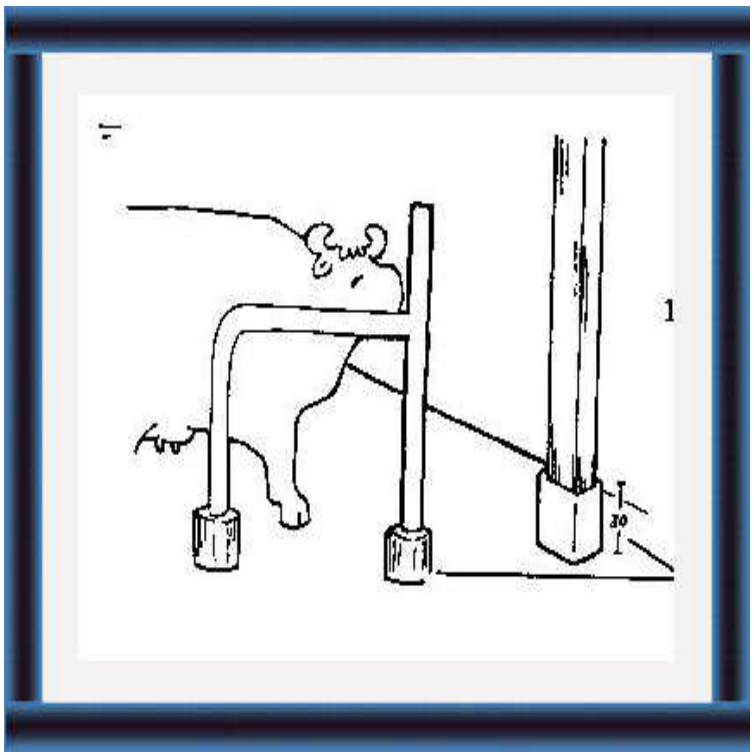


Pillars and posts

117 Pillars and posts within the shed can be made of:
- wood
- galvanized piping (of correct gauge and diameter) or
- bricks/cement or concrete.

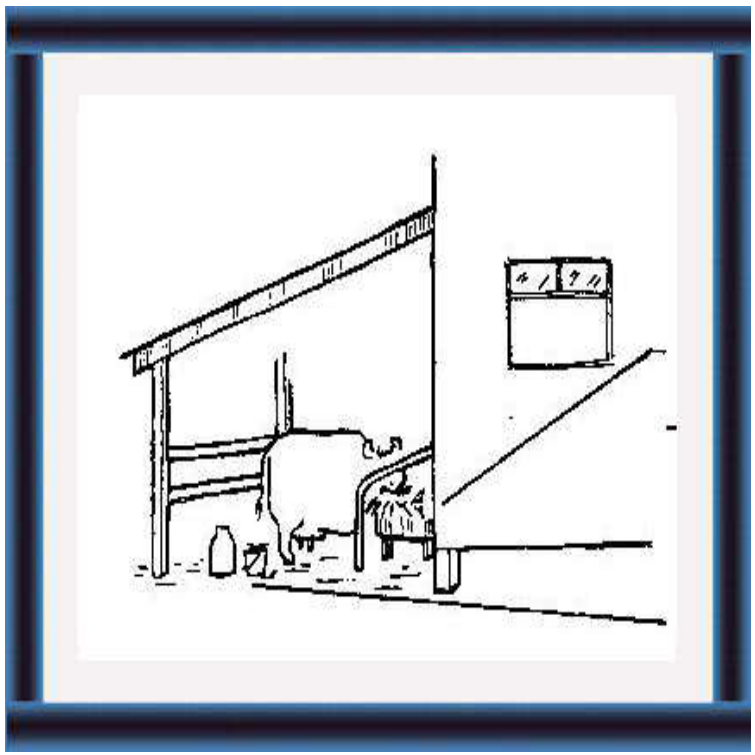
Side walls, curtains etc.

For most places in the region, the best arrangement would be to have the sides open. When the shed is constructed making use of an existing wall, it automatically gets bounded by a complete wall on one side. Consideration should be given to the possibility of selecting a wall which would also serve as a wind barrier where strong winds are present. It is usual to have the feeder towards the wall end of the standing as more space is required at the hind end of the animal for milking, A.I. etc. (119-121)

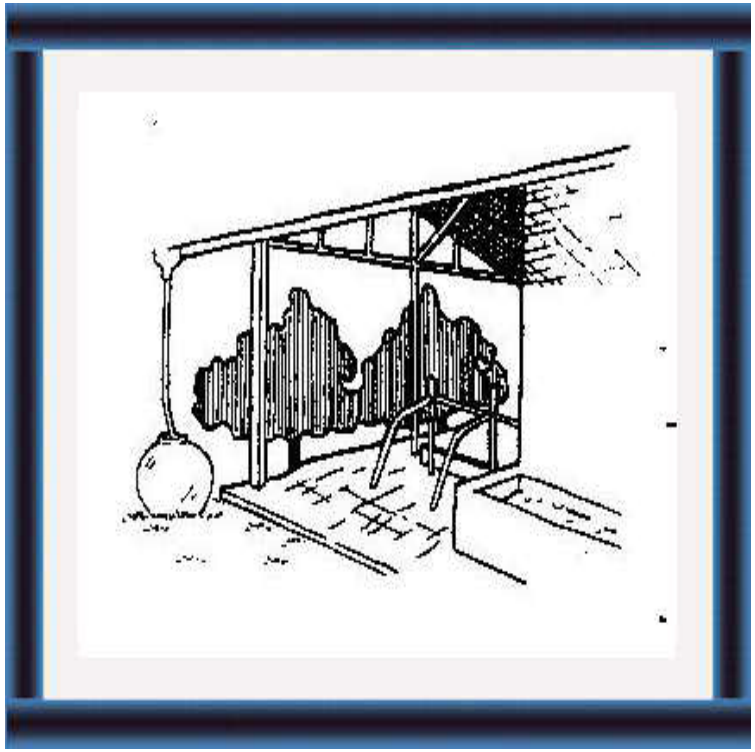


118 You can make **wood** and **galvanized piping last longer** by putting **concrete** around the **base** of the **pillar** to a height of 30 cm.

Side walls and curtains
119 Choose the **wall** of **another building** which helps **protect** from **wind** and **rain**.



120 Place the **feeder near wall** so you have **more space** at the back of your animal for milking, A.I. etc.

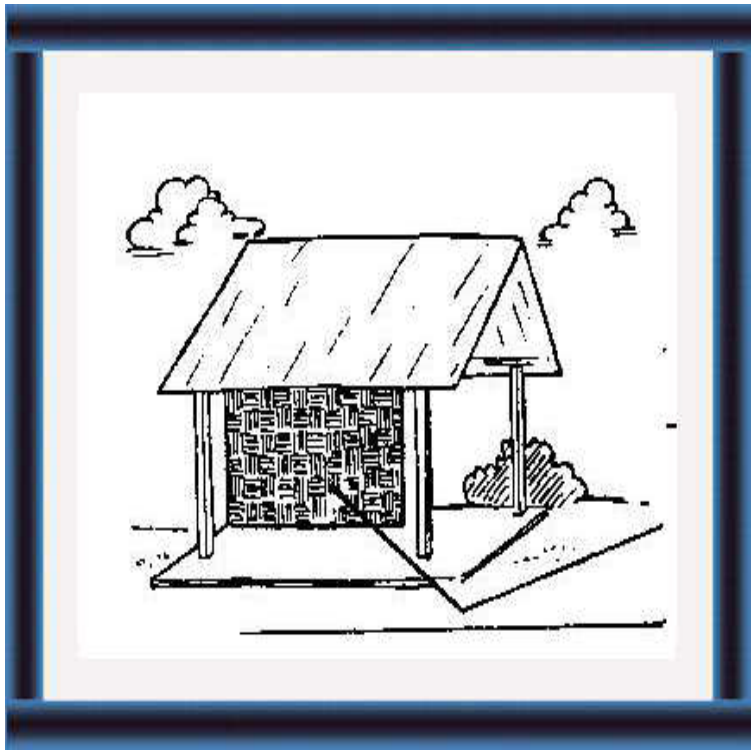


121 In most areas, it is better to have the **sides open**.

In areas with extremely cold winters and/or strong cold winds, it may be necessary to construct half walls or even full walls on one or more sides of the shed. These should be considered only when a temporary curtain is not sufficient. (122, 124))

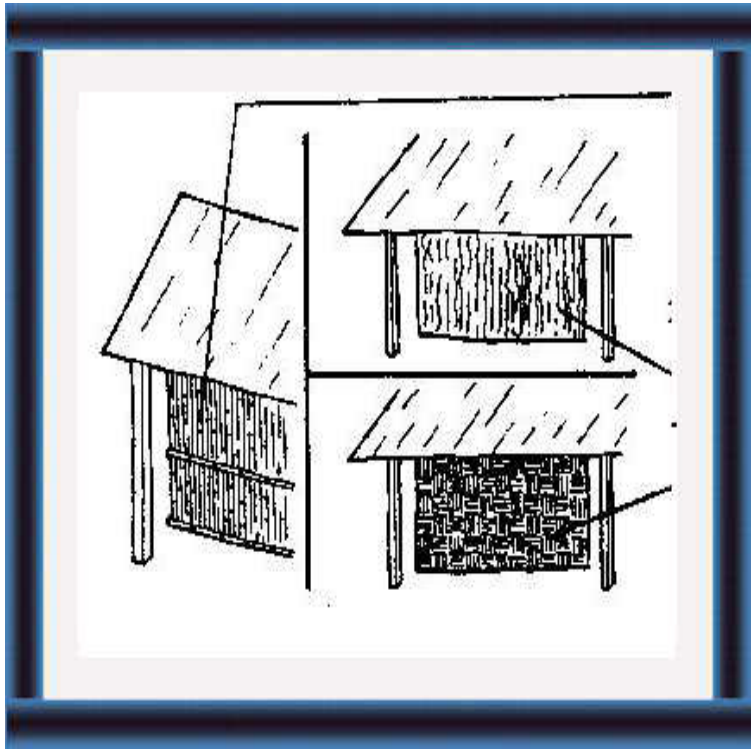
The material to be used for curtains can vary from dried grass or straw to cadjan or bamboo strips. (123)

The material to be used for the half walls/walls may be bamboo or any other wood, wooden planks, wattle and daub (wood/bamboo structure covered with mud) plastered with lime and sand mixture or brick and cement. (125)

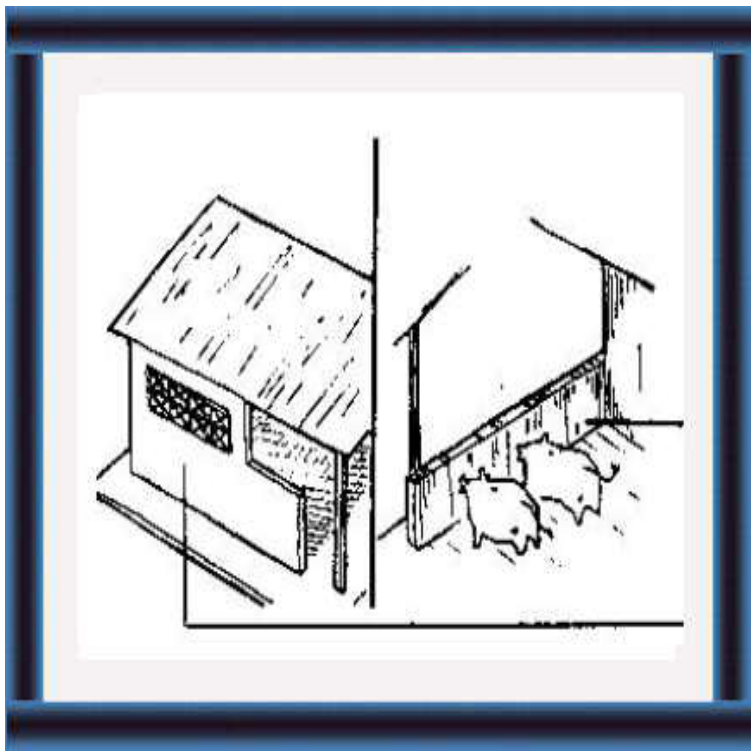


122 In areas with **cold winters** and/or **strong cold winds**, try to use **temporary curtains**.

123 You can make the curtains of:
- bamboo strips

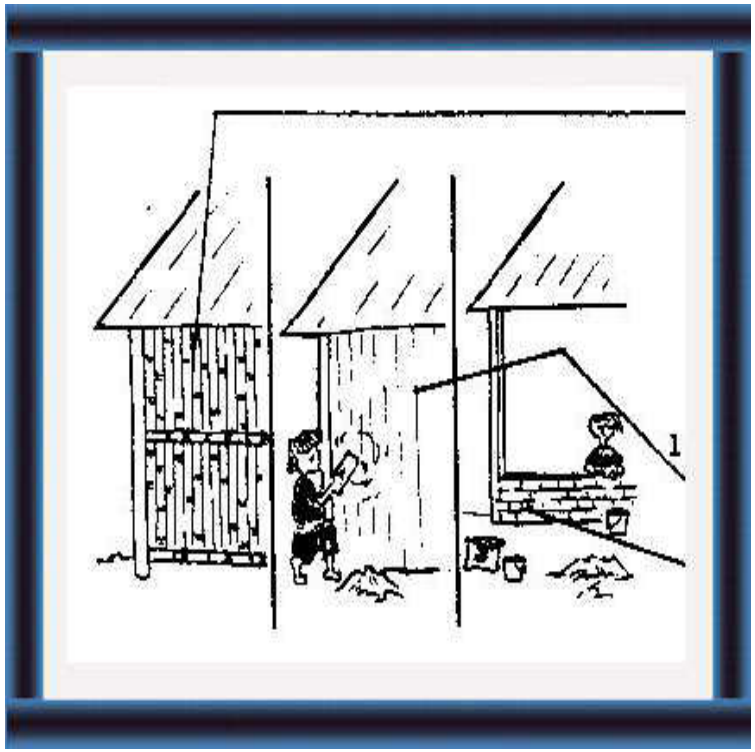


- straw or dried grass
- coconut frond mats.



124 If curtains do not give enough protection, make:
- half walls or
- full walls

on one or more sides of the shed.



125 You can make walls of:
- bamboo or wood
- wattle and daub
- bricks and cement.

Storage of milk utensils

The ideal arrangement would be to have a separate room with good light and ventilation for storing milk utensils. (126)

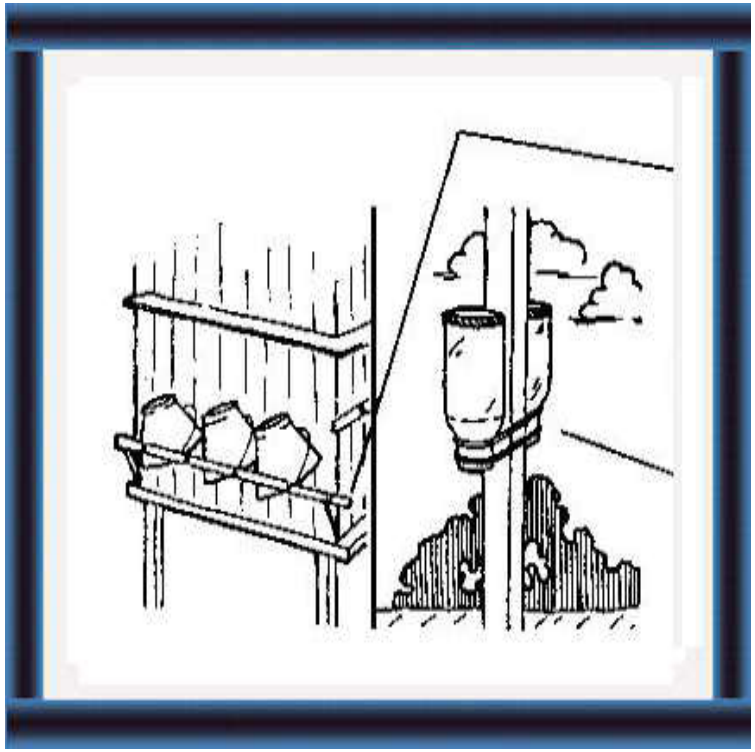
However, a sufficient degree of cleanliness and hygiene can be achieved by having a rack attached to an existing wall or provid-ing an arrangement to hold the milk cans against a post but not close to standings or gutters. It is necessary that the wash waters get drained off making the utensils dry and that the dust is not disturbed or any dung/urine etc. does not get splashed into the utensils while they are being stored. (127-130)

Storing milk utensils

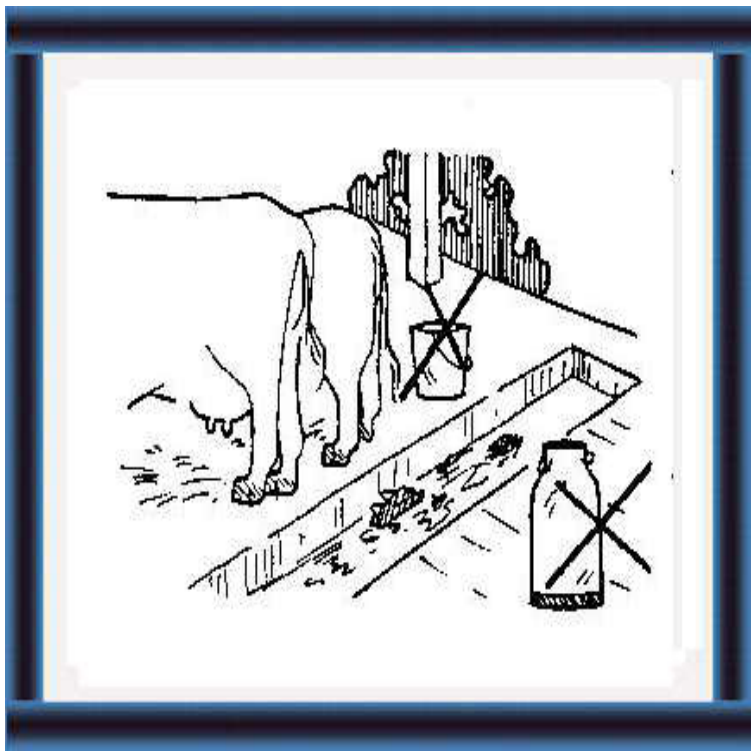
126 if possible, have a **separate room** for **storing milk utensils**.

Make sure there is **good light** and **ventilation**.

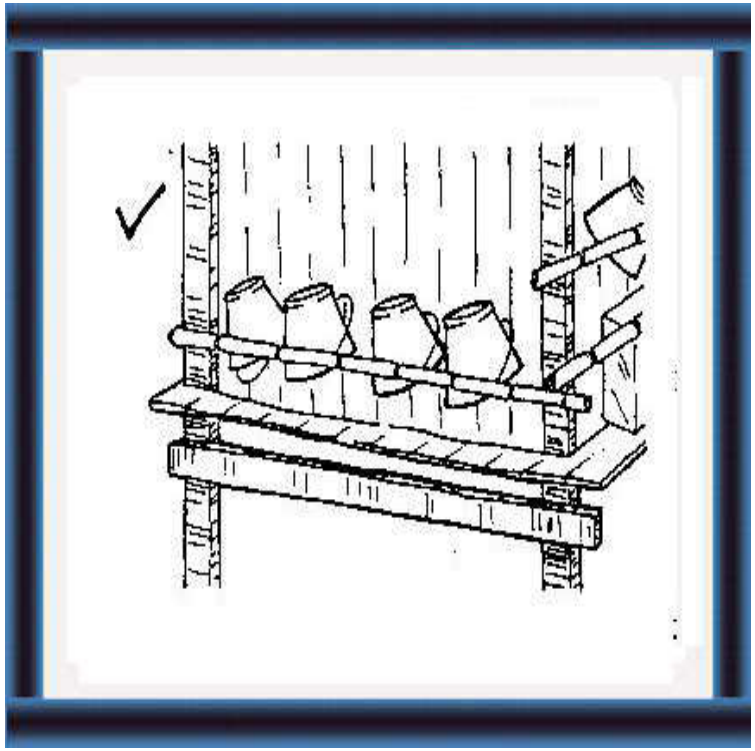
127 But you can keep things **clean** by:



- making a **rack** on a wall or
- **hanging cans** against a post.



128 **Do not** store milk utensils close to standings or gutters.



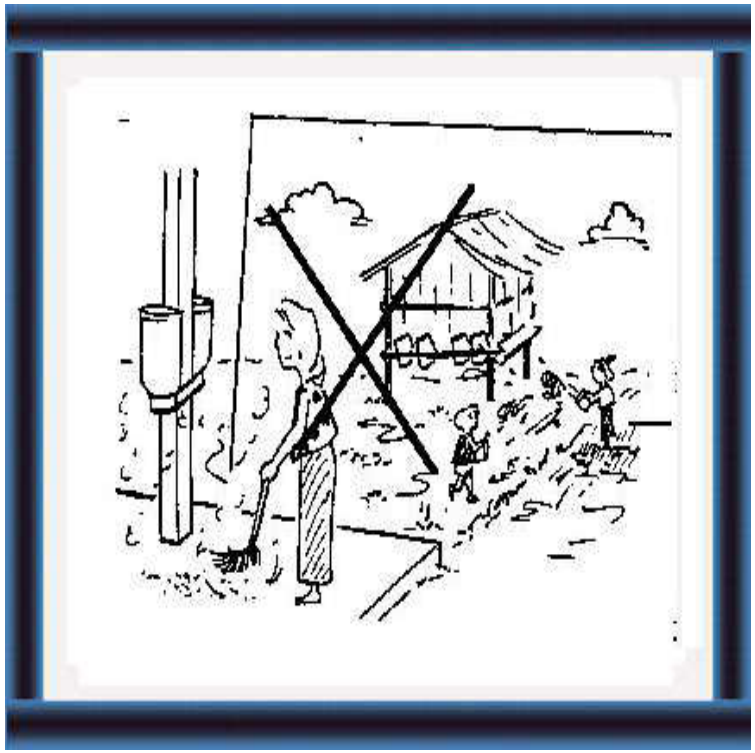
129 **Make sure** the water can **drain off** the utensils **easily**.

Collection and storage of rain water

Rain is a very cheap source of clean water suitable for all purposes in the shed. (131)

The usual method of collection is to attach a gutter made of galvanized sheeting or, plastic (or even wood) to the edge of the roof and to lead the water through a down pipe made of galvanized sheeting, plastic, earth or cement to a storage tank/container of appropriate shape and capacity. (132-133)

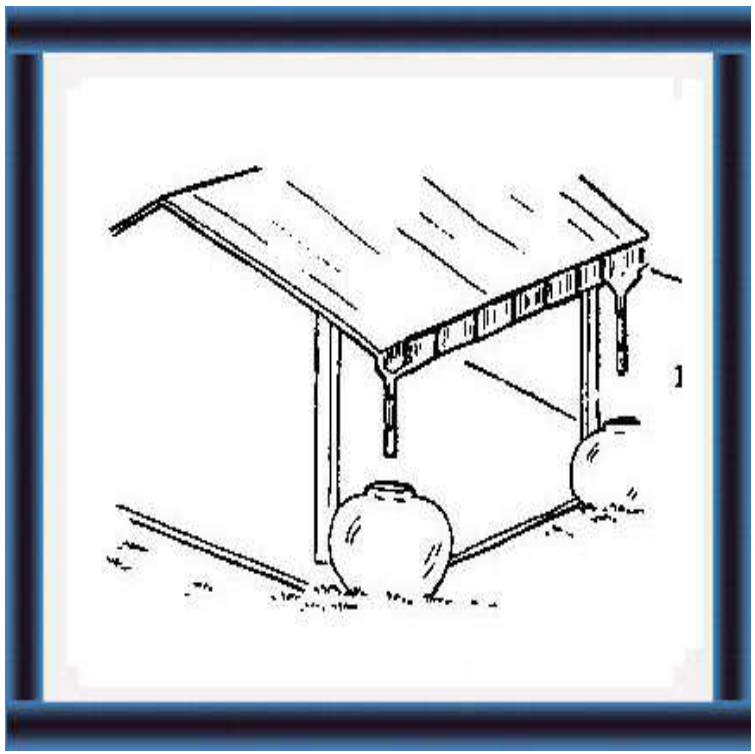
Collecting and storing rain water



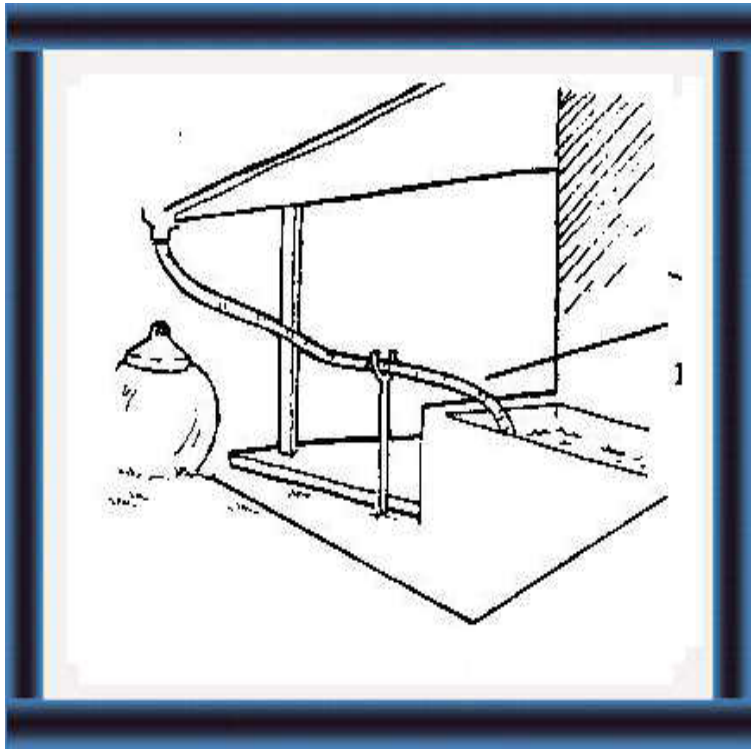
130 **Do not**
- make dust
- splash dirty water
on to utensils which are drying.

131 **Storing rain** is a **cheap** way of getting **clean water**

for your farm.



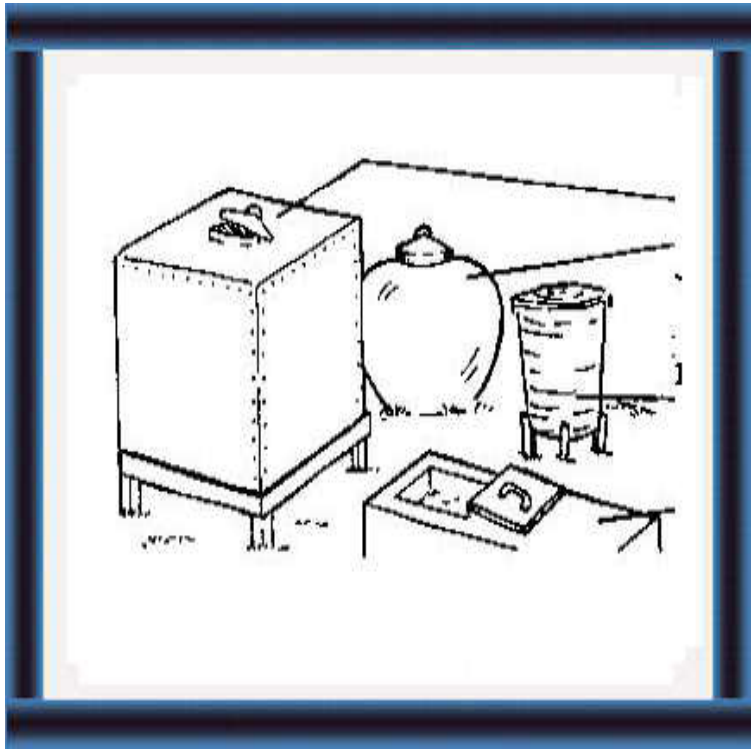
132 You can collect it from your roof with a **gutter** made of **plastic** or **galvanized sheet** or even **wood**



133 through a **pipe** of galvanized, plastic, earth or cement to a **storage tank** or container.

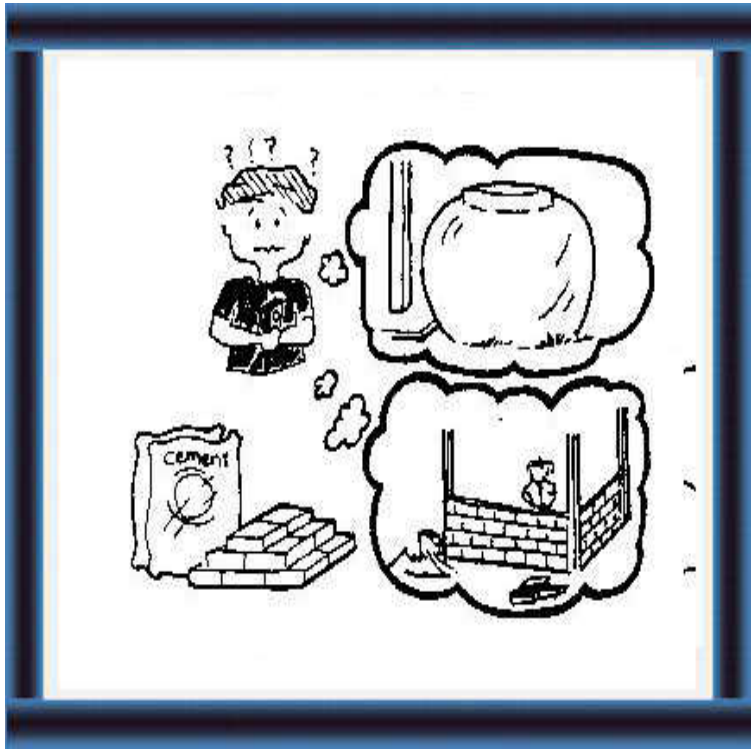
The storage container may be made of earth, fibre glass, metal that does not rust easily or brick and cement. Some savings can be made by erecting a brick and cement tank in a corner between two existing walls, provided they are strong enough and leak proof. (134-135)

The sizes and numbers of the containers to be kept on any farm will be determined by the availability of other clean water (and costs of bringing same to the site), the rainfall patterns of the area, the costs of construction/purchase and the investment capability of the farmer.
(136-137)



134 The storage tank may be made of earth, fibre glass, metal (if it does not rust easily) or brick and cement.

135 You can **save money** by building a brick and cement tank **between 2 walls** if they are strong and do not leak.



136
When planning the type, size and number of water containers, think about:
- the cost of buying or making them.

137
The rainfall
other clean water supply
the cost of bringing clean water to your farm.

Housing of dairy calves

The housing of dairy calves needs more attention because they are more susceptible than adult animals to adverse environmental conditions including diseases. (138)

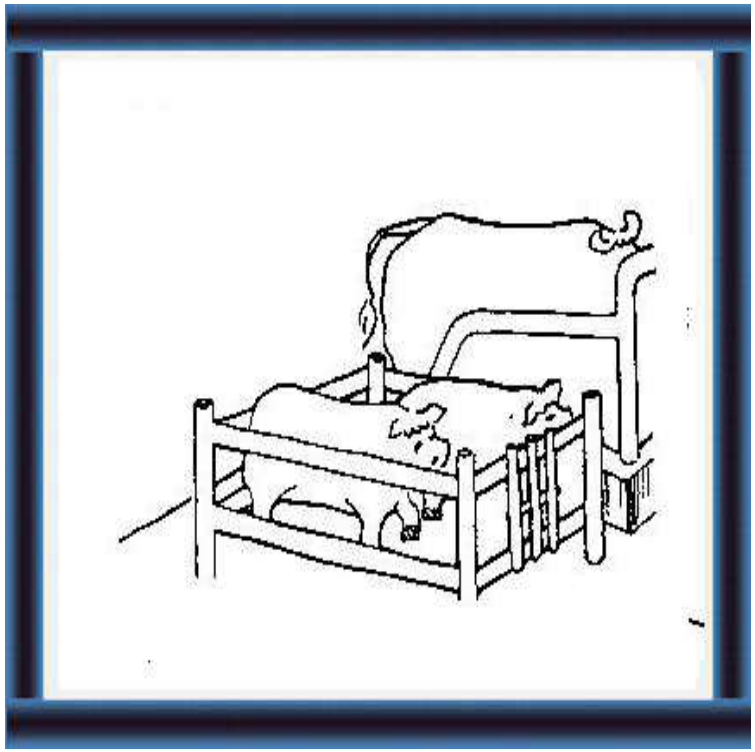
In its simplest form, a calf house can be just a separated out area in a cattle shed. This arrangement is suitable in a dry area, where adequate ventilation can be provided without the risk of the calf getting exposed to severe cold winds etc. Even under these conditions, it is best to provide individual pens for the calves and prevent calves of different ages being kept together. (139-140)

In areas which require closed housing, e.g. extremely cold climates, strong cold winds etc., and in damp conditions, where it is difficult to keep the floor dry, calf pens are usually fitted with a raised platform. The platform (slatted floor) may be made of strips of wood, placed about 15.0 mm apart, to prevent the calf's foot getting entangled in the space between strips. (141)

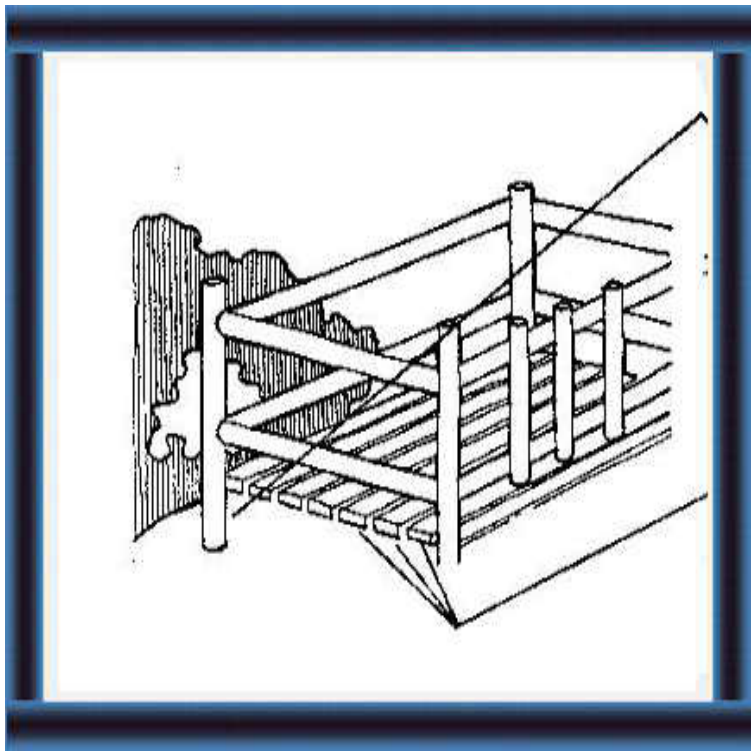
Dairy calves
Housing of dairy calves

138 **Plan** housing for your dairy calves **carefully** - it is easy for them to get disease or suffer from the weather.

139 In dry areas where you have adequate ventilation without cold winds, you can **separate** part of your shed for your calves.



140 But make separate pens for **each calf** (or keep only 2-4 calves of same age in one pen with adequate space).
Do not keep calves of different ages together.



141 In areas which are cold or wet, **raise** the **floor** of the calf pen to keep it **dry**.
Use strips of wood 15 mm apart so that your calf's foot **cannot go through**.

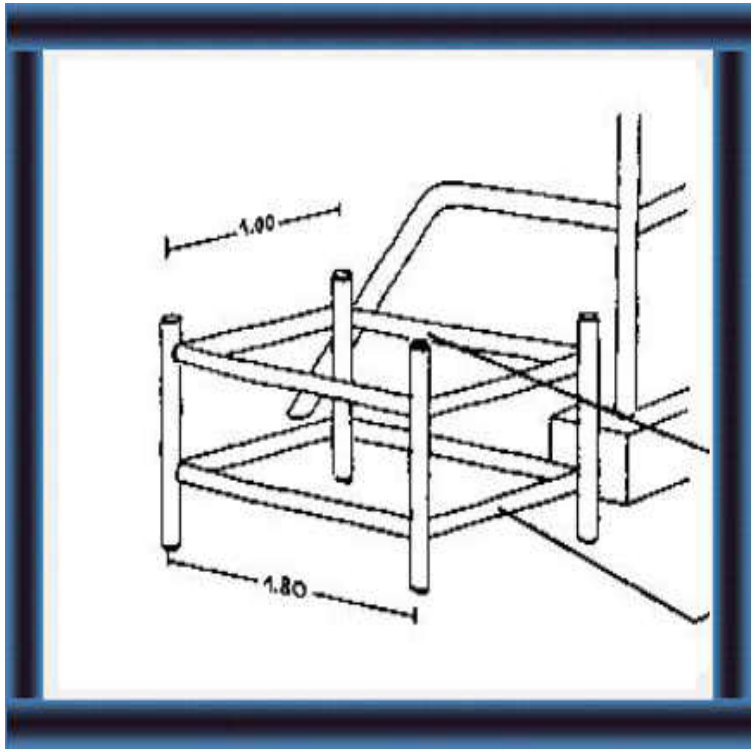
Adequate space should be provided in a calf pen, as the calf is expected to be housed in it till it is about 3 months old. An individual pen may be 1.80 m x 1.0 m in size. (142)

Movable calf pens

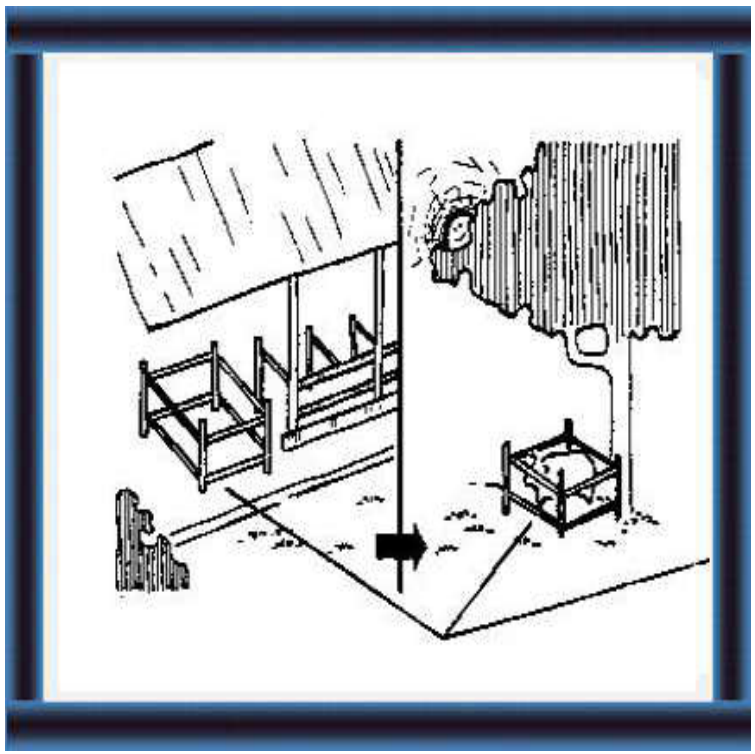
The space within the cow shed can be put to optimum use and the calf pens can be maintained in a very high state of hygiene by using movable calf pens. By moving the pens outside the shed to a suitable pasture area, the calf can be offered good quality roughage as well. (143-144)

Feeding and watering

A feeding rack can be fixed within the calf pen while a concentrate trough and a bucket for water/milk placed on a holder outside the pen, but within easy reach of the calf. (145)



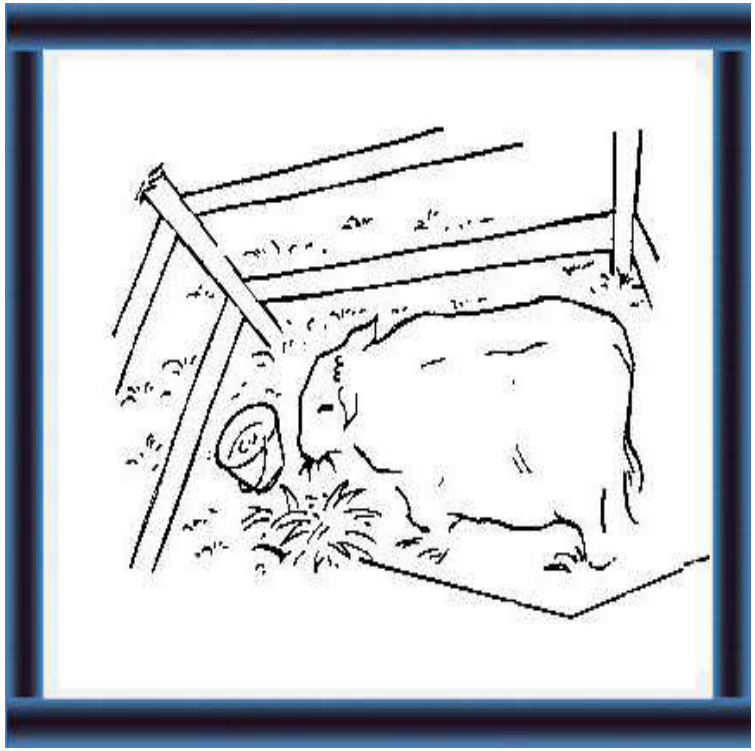
142 Your calf stays in the pen until about 3 months old so make sure it is **big enough** - about 1.80 m x 1.0 m.



Moveable calf pens

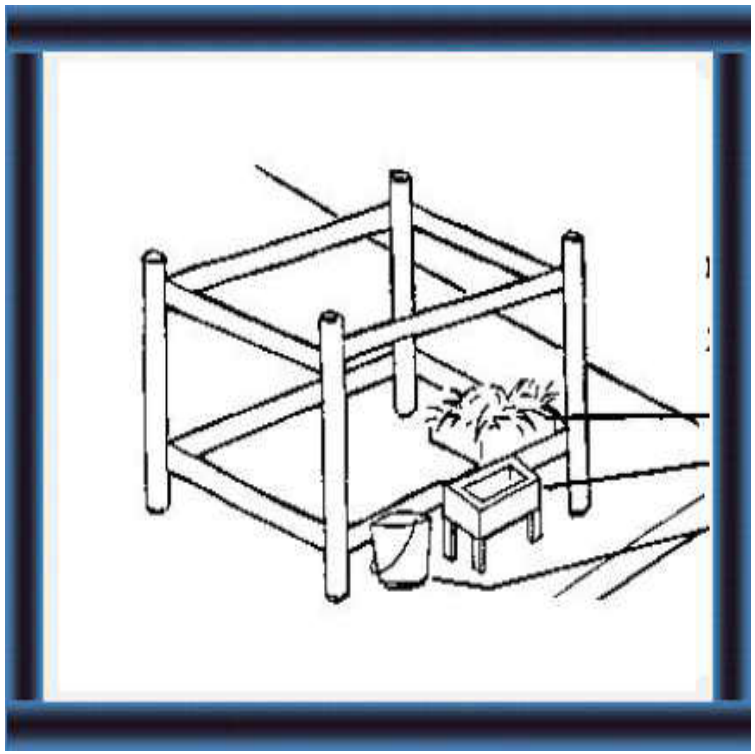
143 You can:
- make **good use** of **space**
- keep everything **clean**

by using moveable calf pens.



144 By moving the pen to a **suitable pasture** area, you can offer **good quality roughage** as well.

Feeding and watering



145 You can place the:

- **feeding rack inside** the pen
- **concentrate trough** and **bucket** for milk/water **outside** the pen within easy reach.

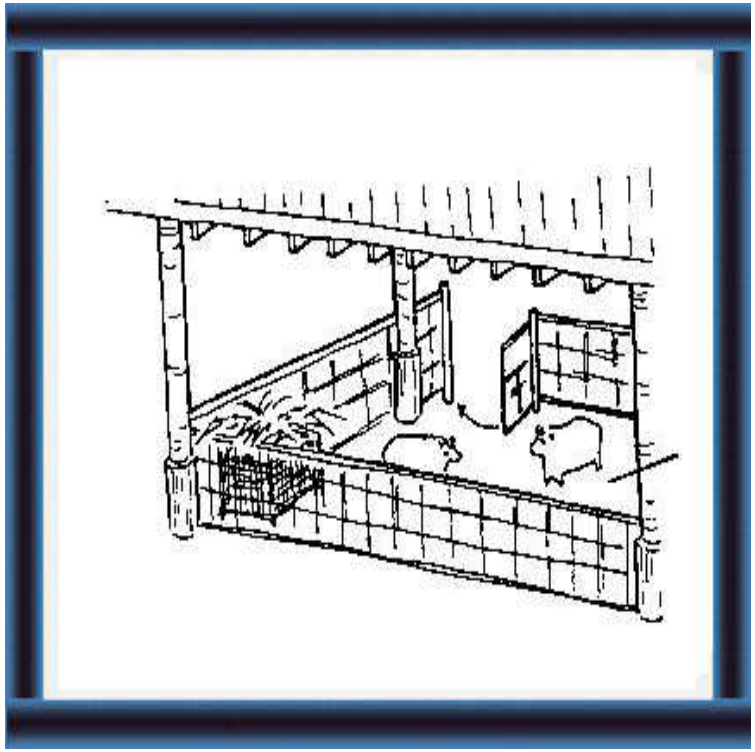
Exercise yard

When the calf's movements are limited within a calf pen, it would be useful for its healthy growth to provide an exercise yard. (146)

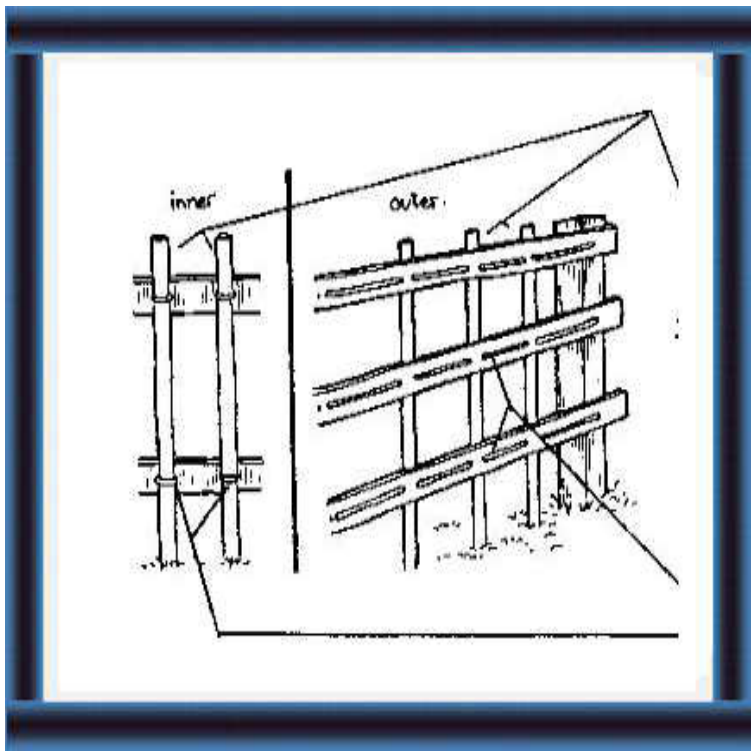
Materials such as barbed wire that can injure the animals should not be used in these areas. (147)

A simple arrangement of a perimeter fence for an exercise yard is to fix horizontal shafts (made of wood or coconut) to wooden posts placed about 1.80 m apart and to tie the droppers by rope (made of coir or similar material) through holes drilled in the horizontal shafts. Whole bamboo and/or bamboo strips may also be used for the perimeter fence.

Exercise yard



146 Calves in pens need an exercise yard for **healthy growth**.



147 **Do not** use nails or barbed wire in the area.
Tie **droppers** (wood or bamboo) with **ropes** made from coconut fibre.

What do you know about housing for dairy cattle and buffalo?

Important things in designing housing

Construction of simple housing

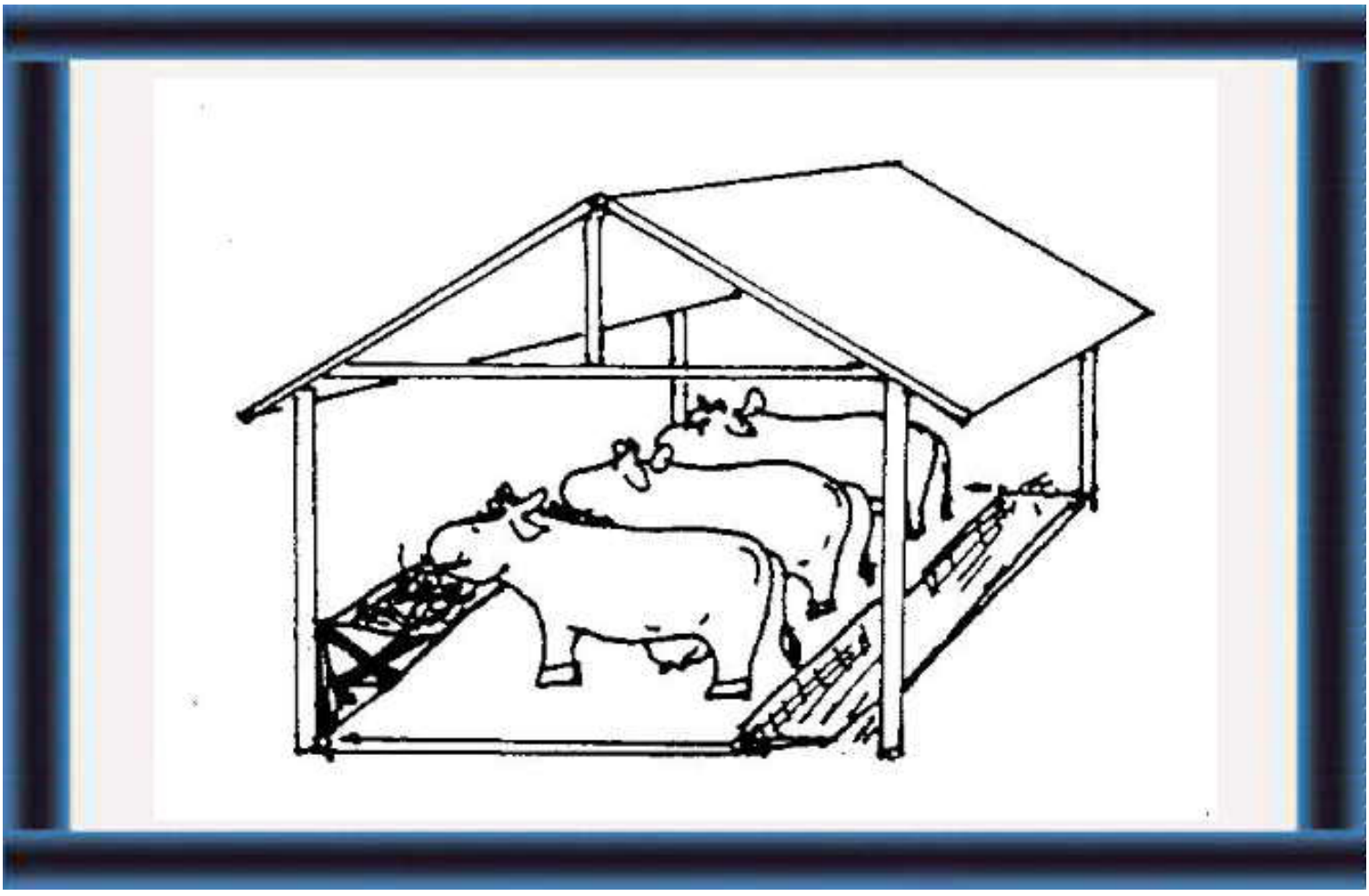
Small-Scale

Dairy Farming Manual

Volume 2

Husbandry Unit 3.2

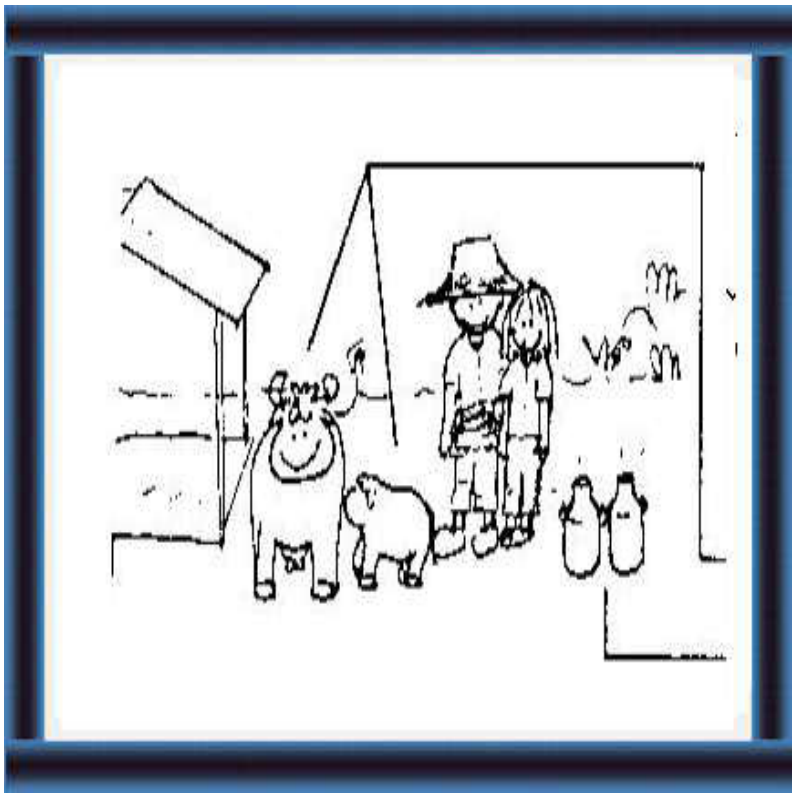
HUSBANDRY IN DAIRY CATTLE AND BUFFALO HOUSING



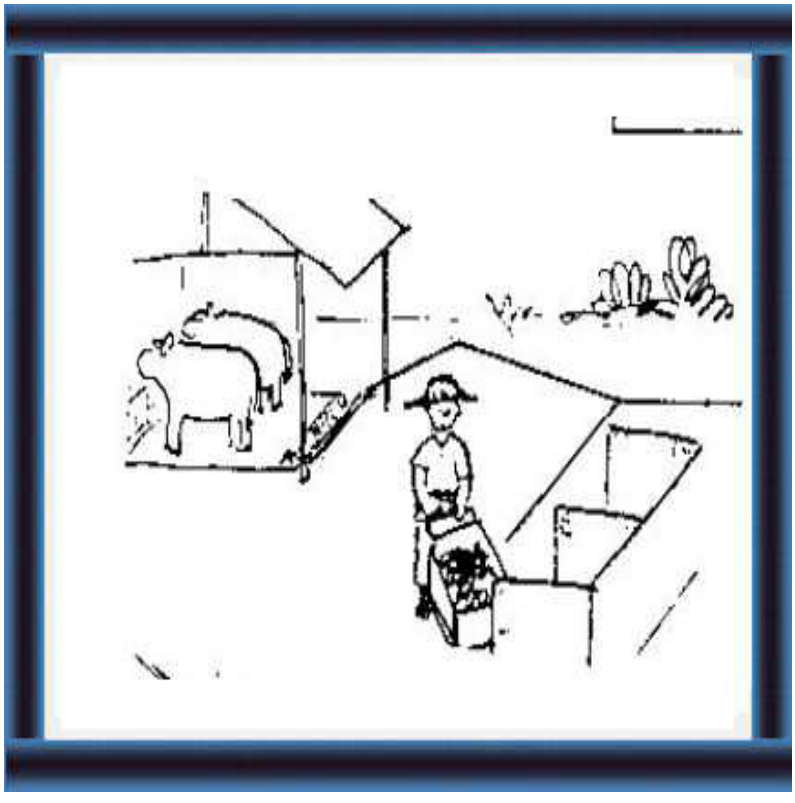
Extension Materials

What should you know about husbandry in dairy cattle and buffalo housing?

Why is clean housing important? (10-17)

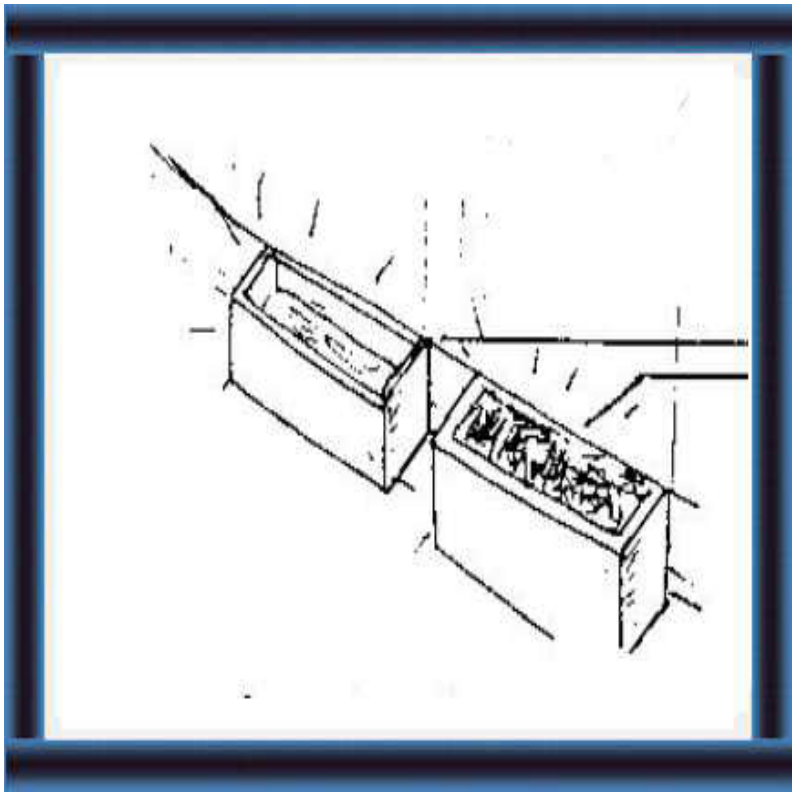


1 Because **clean housing improves** the **health** of your cows and calves and the **quality** of your milk.



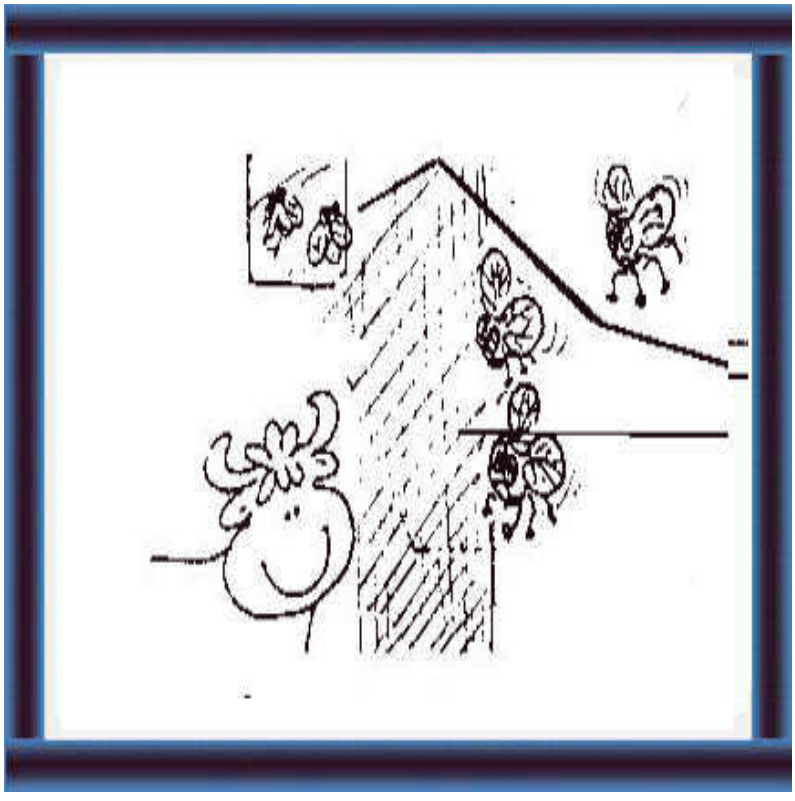
How can you handle manure? (18-23)

2 **Keep manure away** from your animals and use it for **compost manure** or **biogas**.



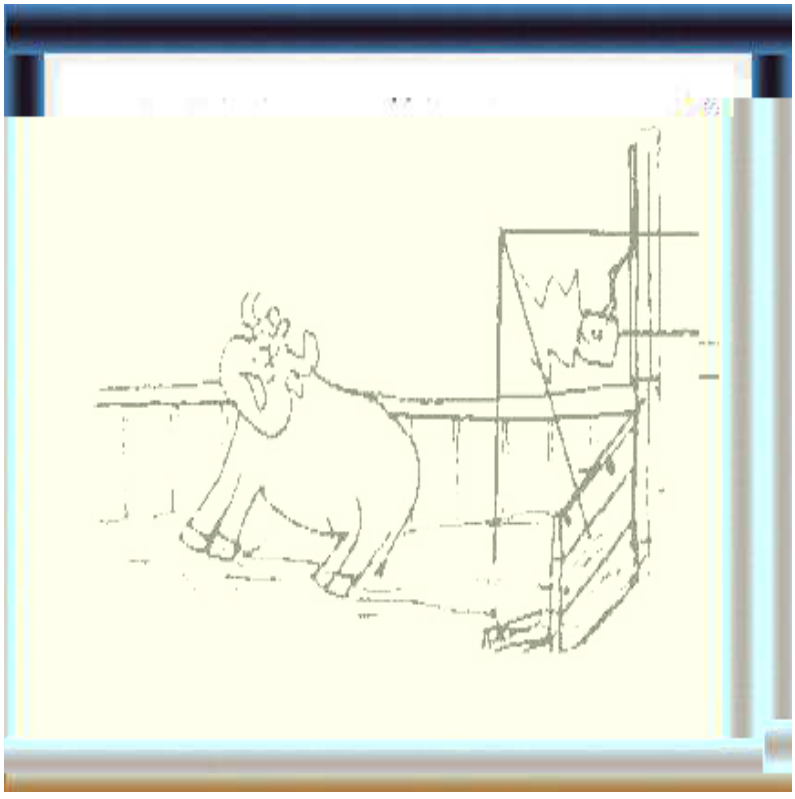
How can you handle feed and water? (24-36)

3 Keep feeders and drinkers **clean** and change feed and water **often**.



How can you handle insects? (37-42)

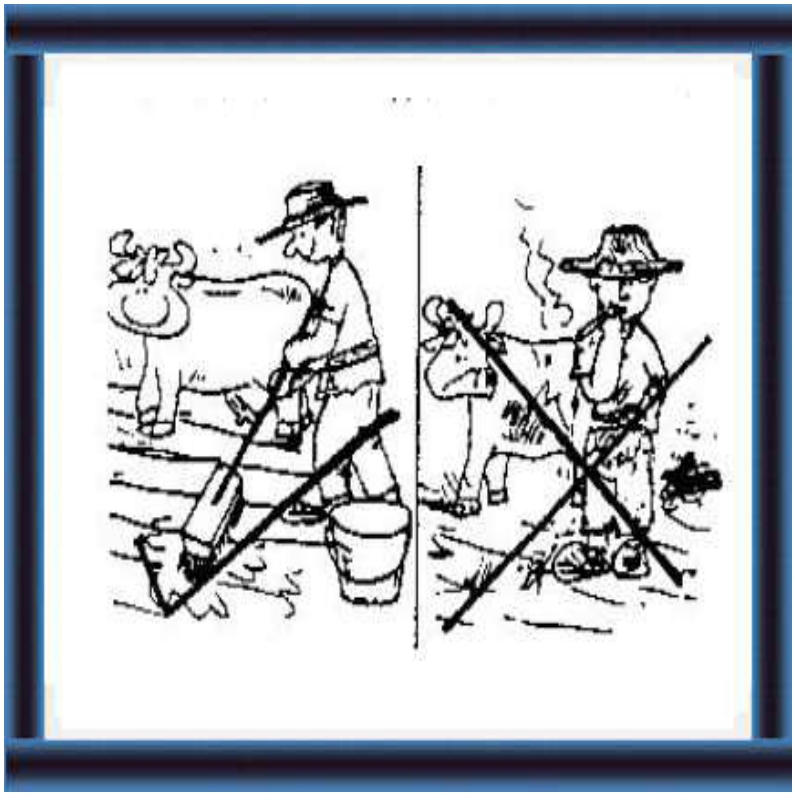
4 Keep **flies** and other **insects away** by using **netting** and/or **flypaper**.



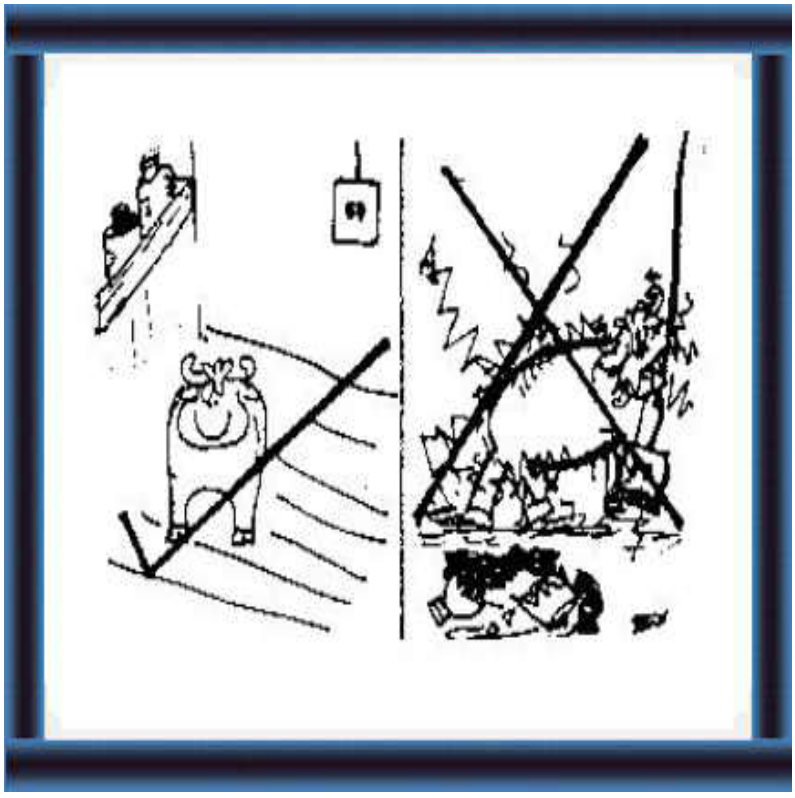
How can you improve safety? (43-48)

5 Make sure floors, walls and fittings **cannot harm** your animals.

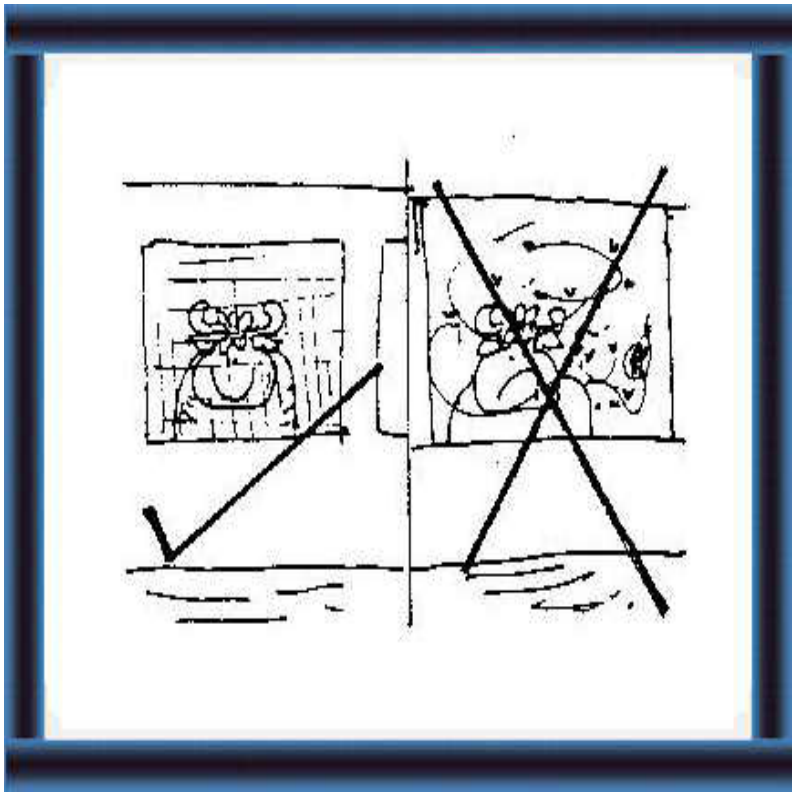
How should you control your animals' environment?



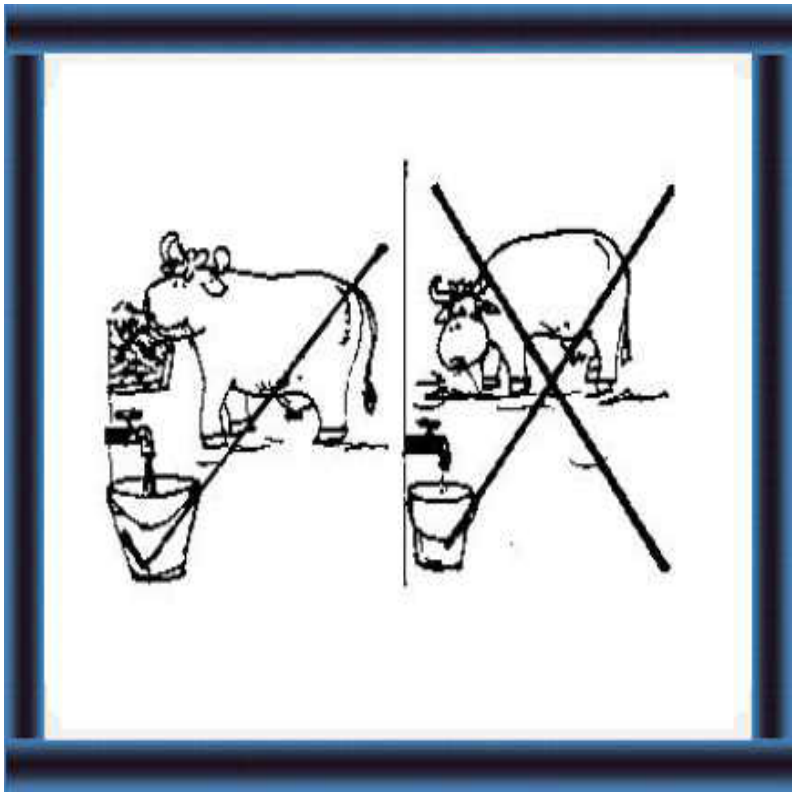
6 **Make sure**:
- it is **clean**



7
- and **safe**

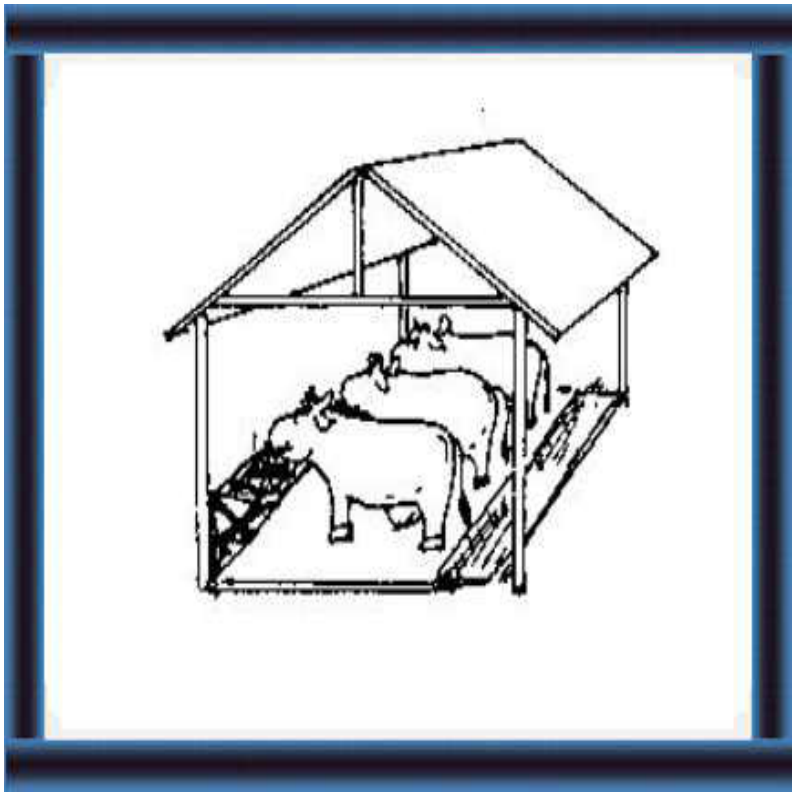


8
- with **few insects**

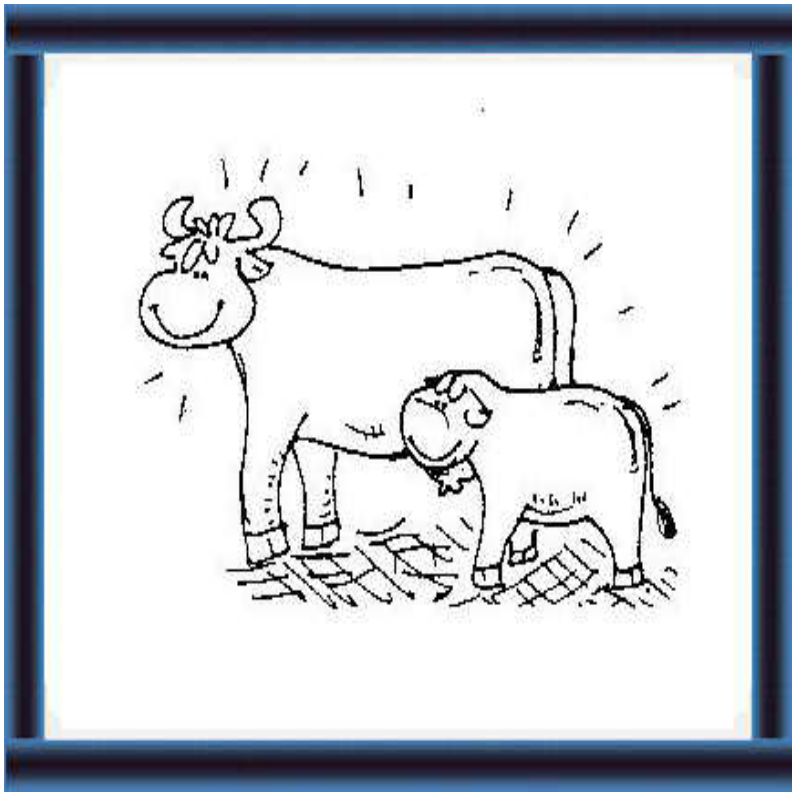


9
- and **good feed** and **water supplies.**

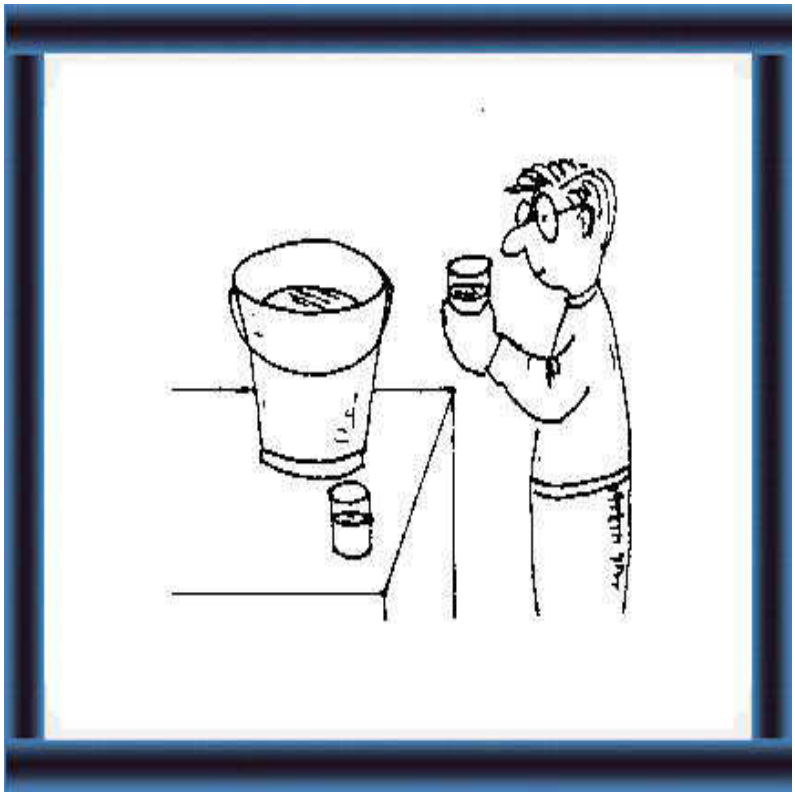
Why is clean housing important?



10 Give your animals **clean housing**



11 and you have **healthy** cows and calves



12 **good quality** milk

13 and you earn **more money**.

14 If you give your animals **dirty** housing

15 you have **dirty, unhealthy** cows and calves

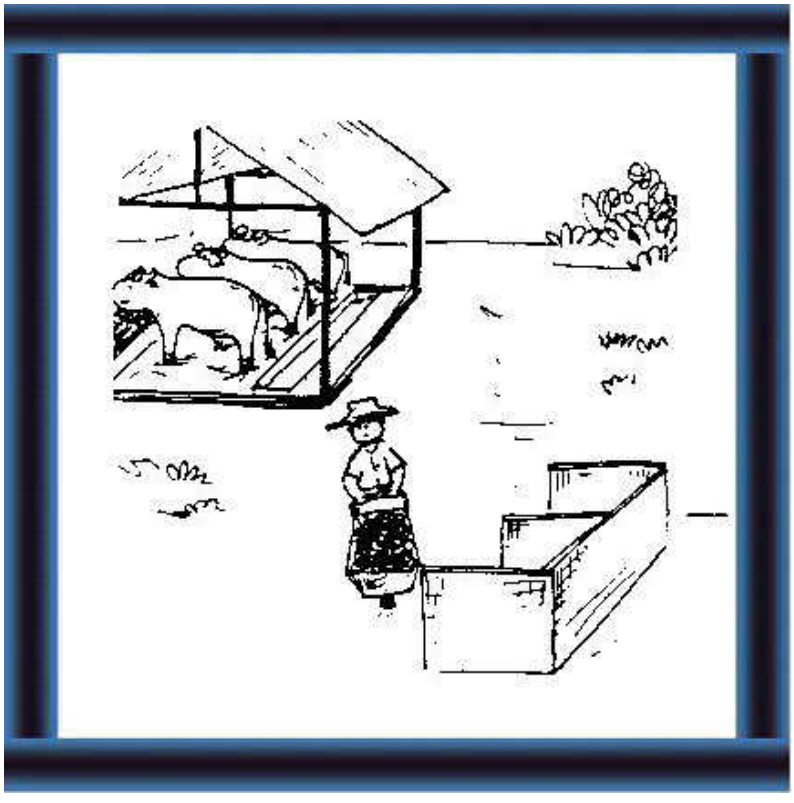
16 **a lower** yield of **poor quality** milk with
- flies
- high bacteria levels
- a bad smell

17 and you earn **less money**.

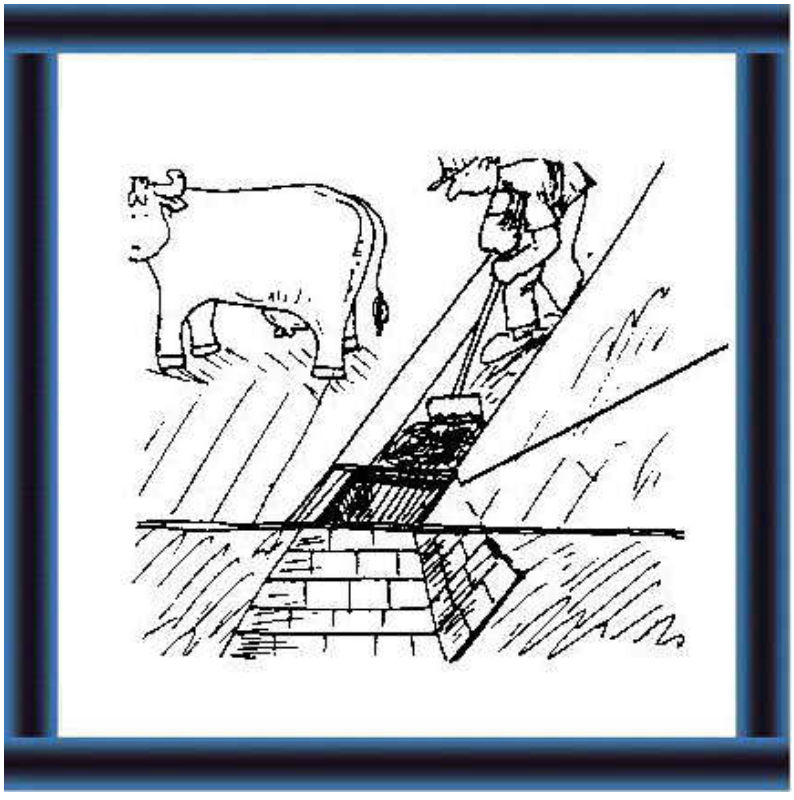
How can you handle manure?

18 **Keep manure away** from your animals' area.

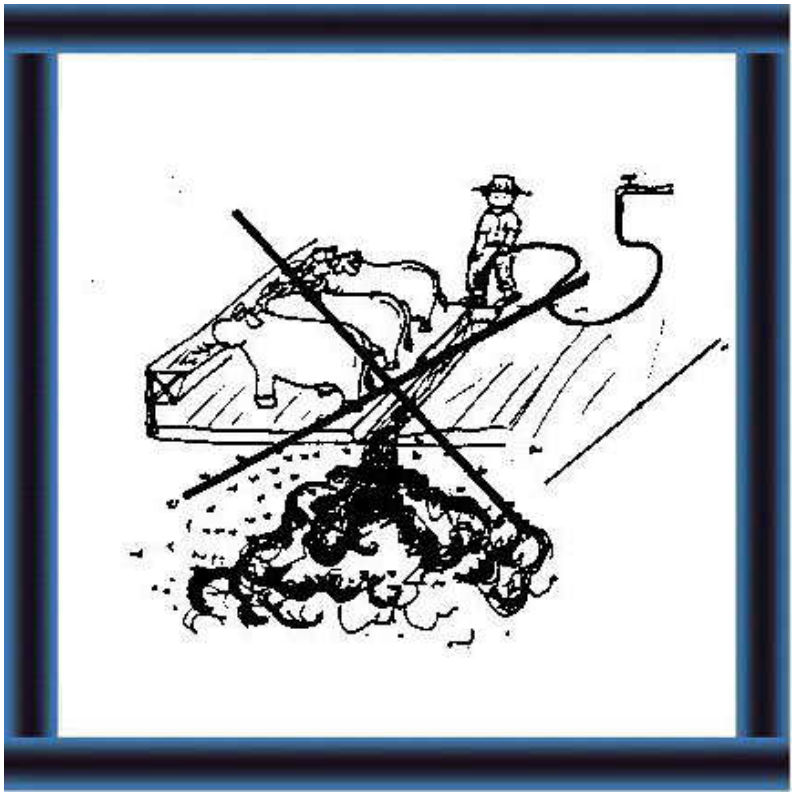
19 **Remove manure** from your cattle shed at least **twice a day, before** milking.



20 Take the manure to a **storage site**, for example a compost heap.

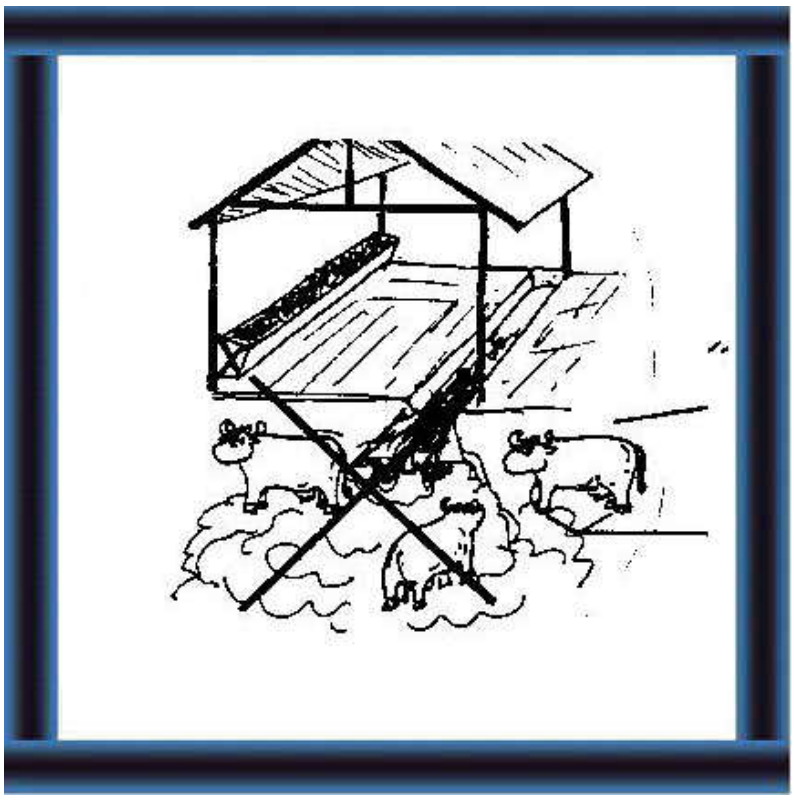


21 You can also **store manure** in a **biogas tank** or a **storage tank** underground.



22 **Never wash** or **sweep** manure out of the shed. Wet, muddy manure-swamps outside the shed create **problems:**
- **insects** come and breed
- **bacteria** increase quickly
- **flies** spread bacteria and diseases and contaminate your milk
- your milk gets a strong unpleasant **smell**.

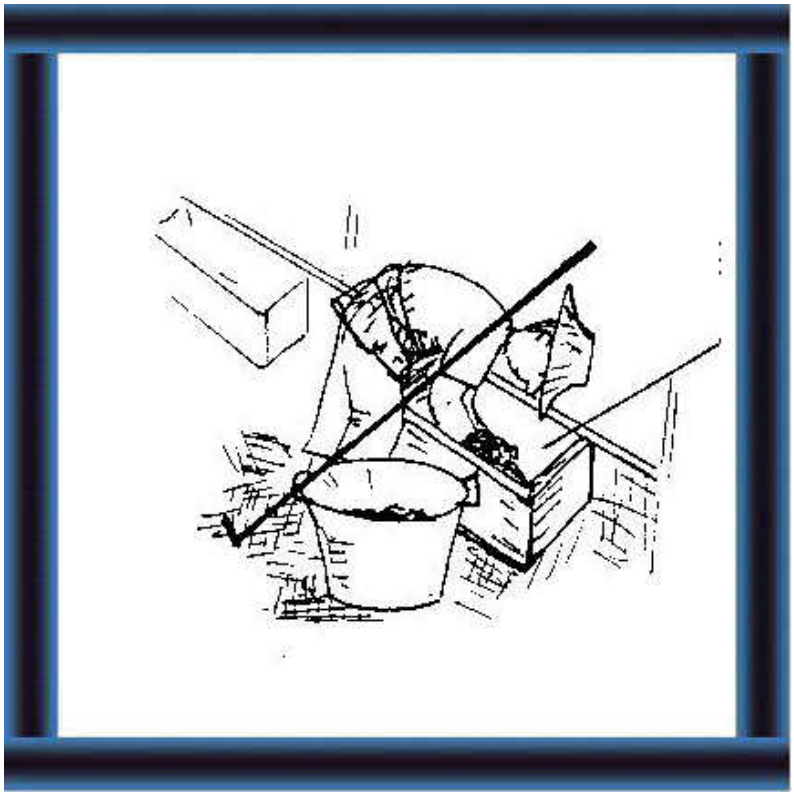
You cannot use the field or area outside because it gets **spoiled**.



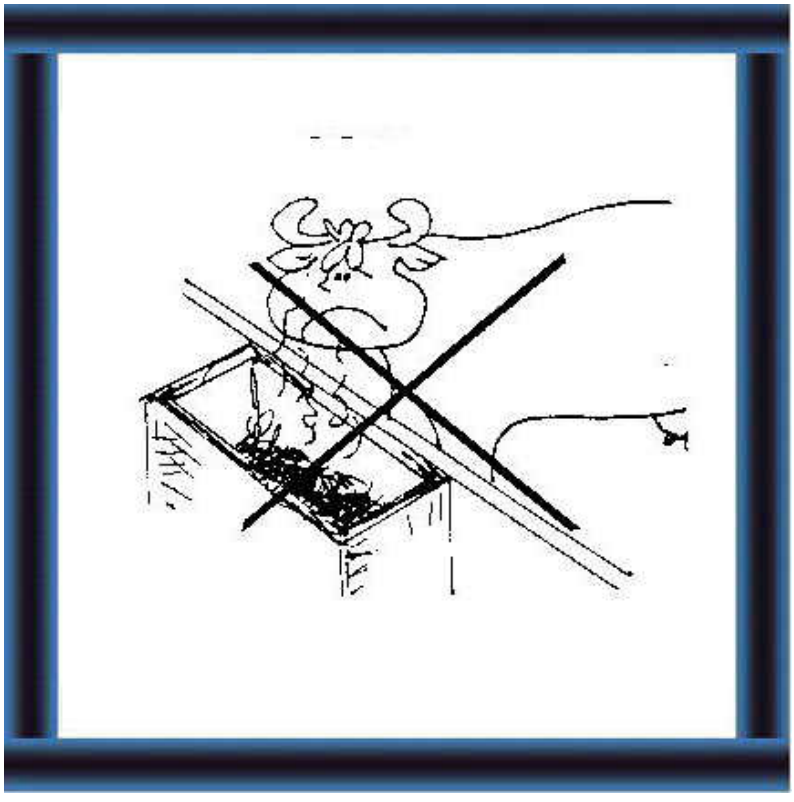
23 If manure runs into your exercise area, **worms** and other **parasites** can spread from animal to animal.
Your cows also get problems with their **hooves**.

How can you handle feed?

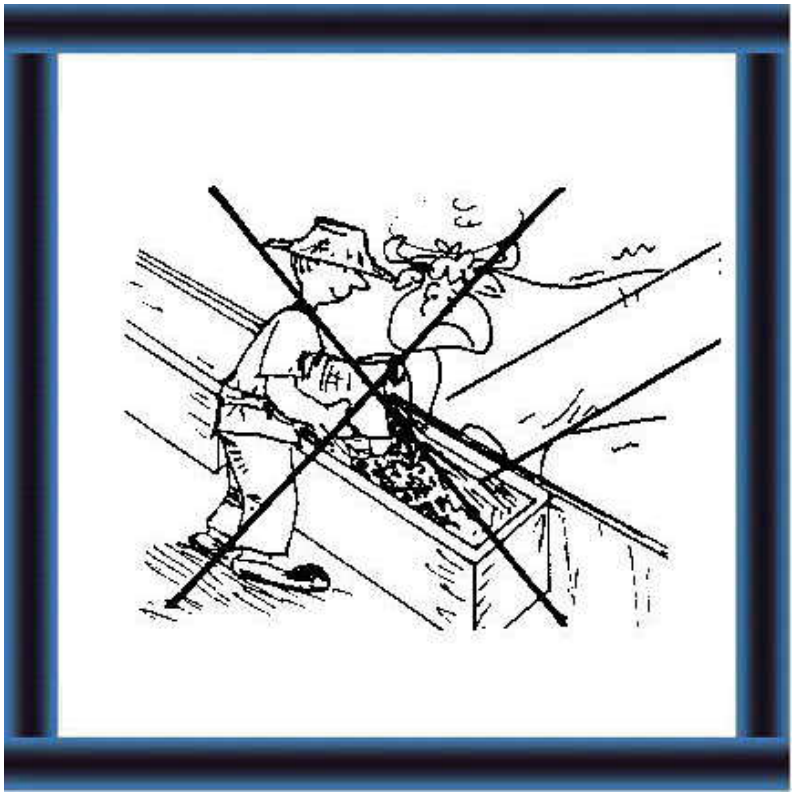
24 **Remove old feed** from feeders **every day**.



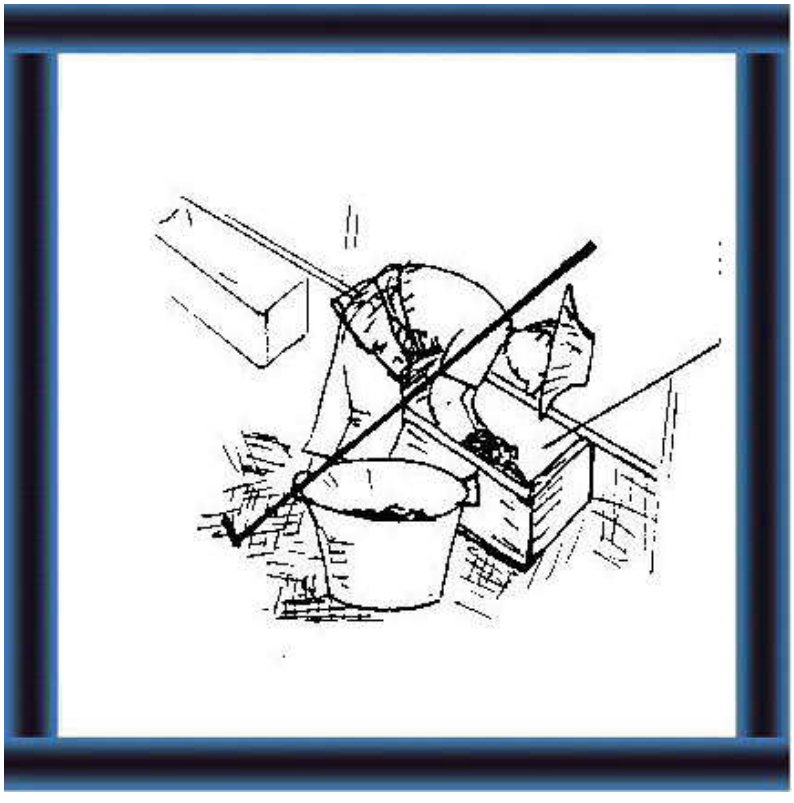
25 **Clean troughs every day**.



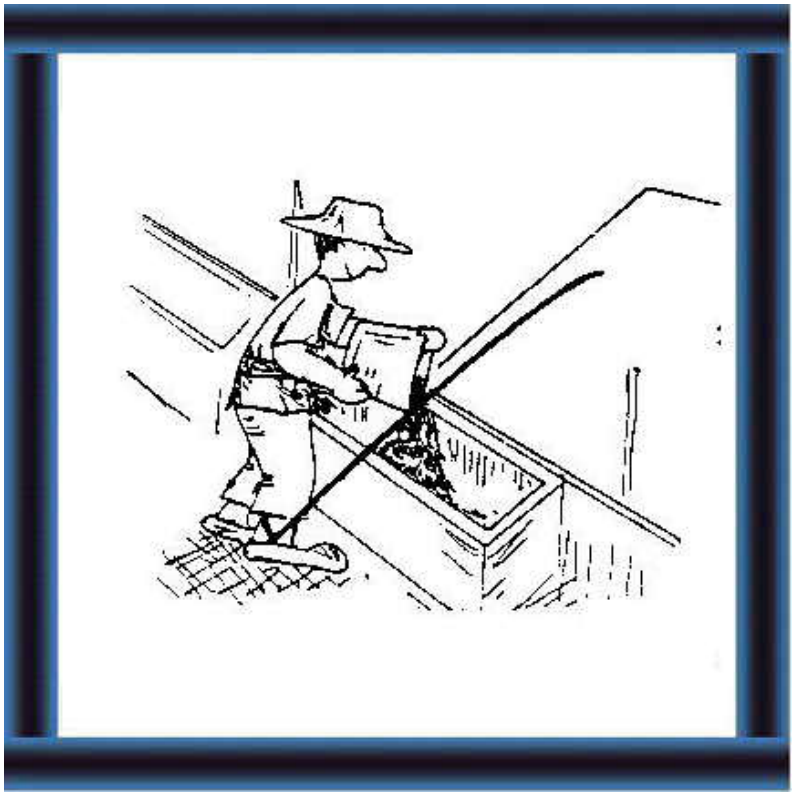
26 Concentrates quickly **spoil** or turn **sour** if you leave them too long in the feeder.



27 **Never** fill fresh concentrate on top of old. The old concentrate **ferments** and your cows become **sick**.



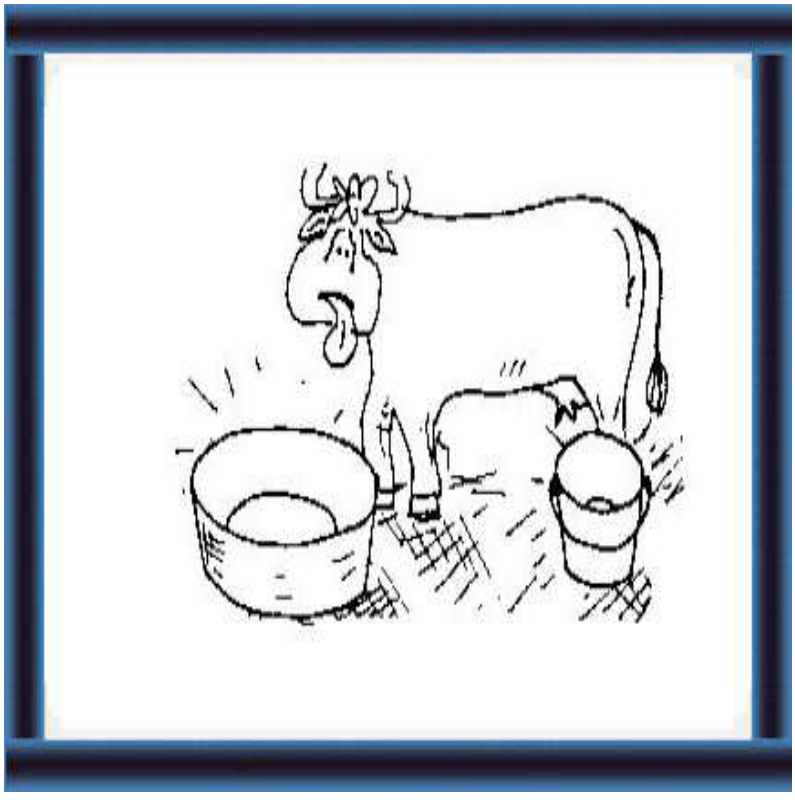
28 **Always remove** the **old concentrate** first.



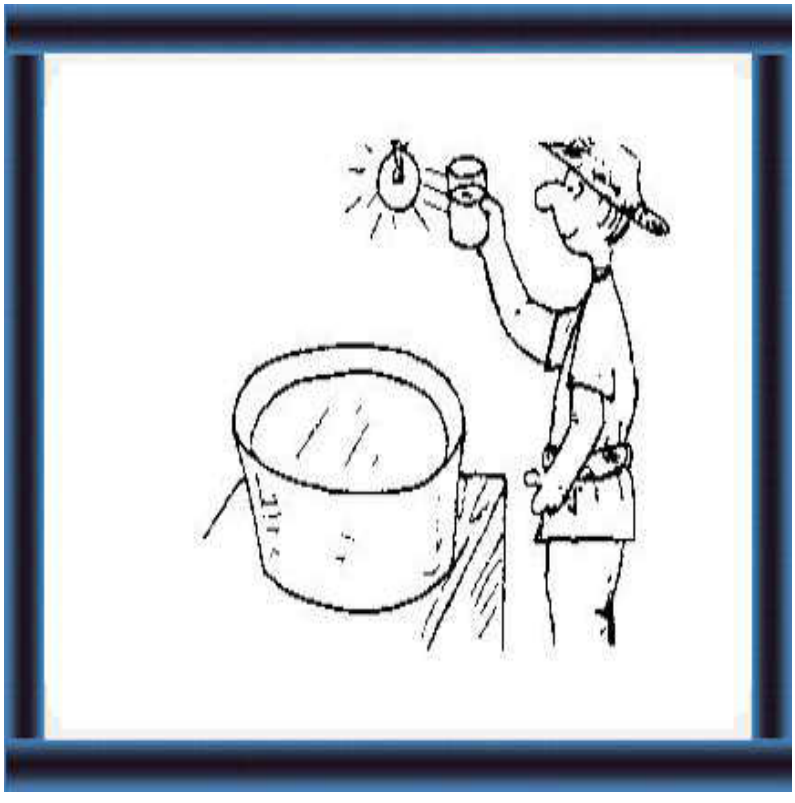
29 **Then** fill with the **fresh concentrate**.

How can you handle water?

30 Cows need **a lot** of water. Give them **as much water** as they want to drink.



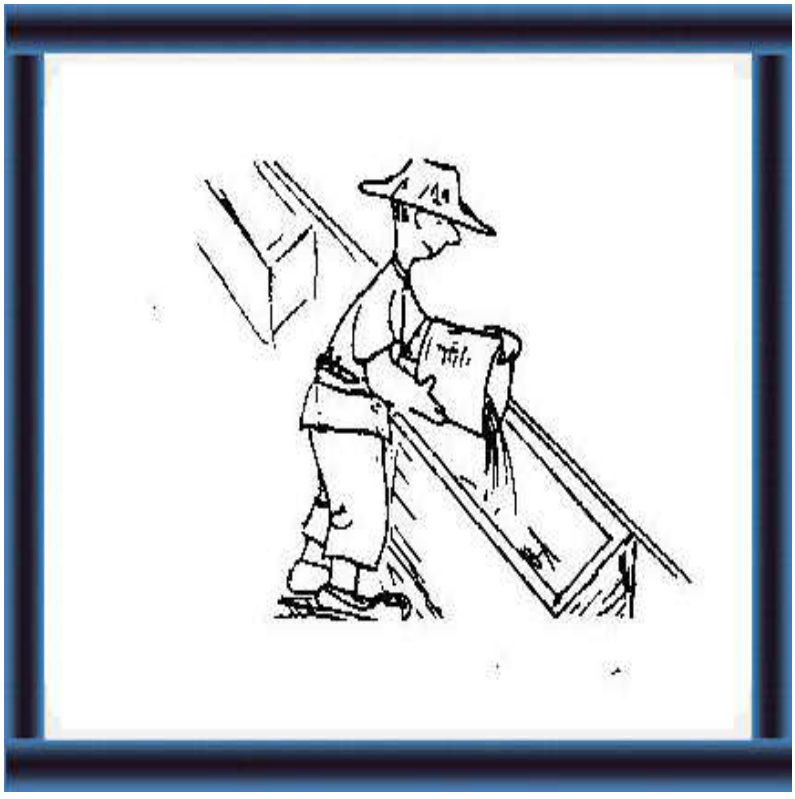
31 If your cow does **not** get **enough water**, she produces **less** milk or **no** milk at all.



32 **Make sure drinking water** for your cows is **clean**.

33 **Empty out** dirty water from drinkers

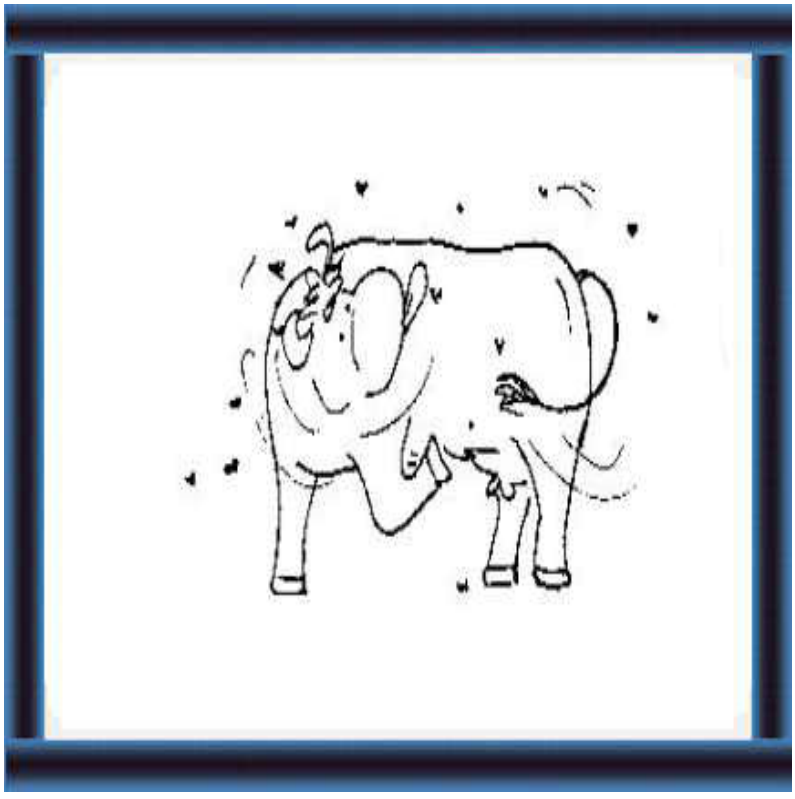
34



35 and fill up with fresh water **every day**.

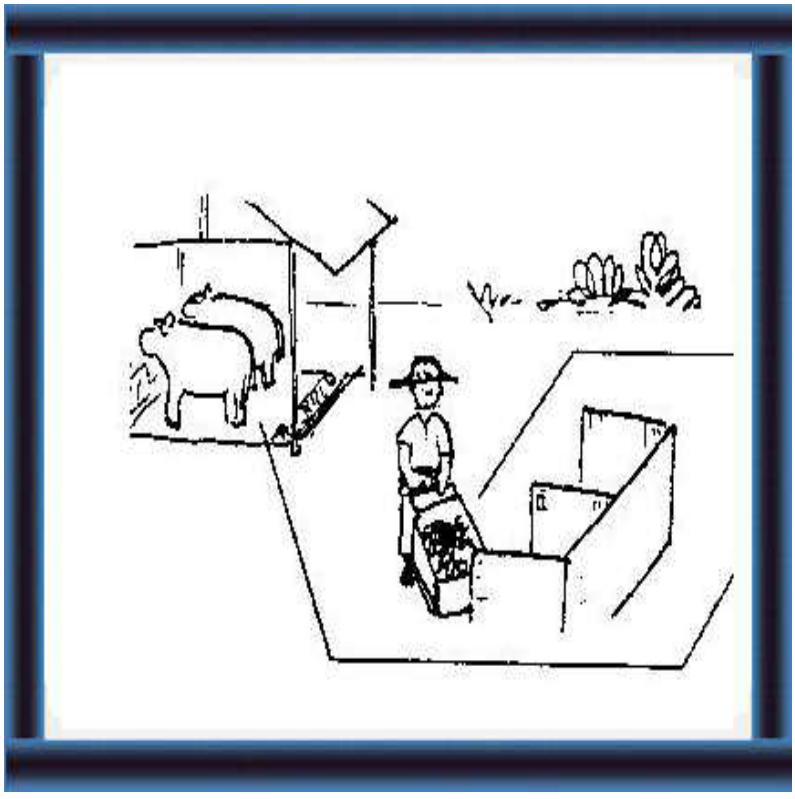
36 If drinking water is left **dirty**, your cows **do not drink** it, and produce **less milk**.

How can you handle insects?

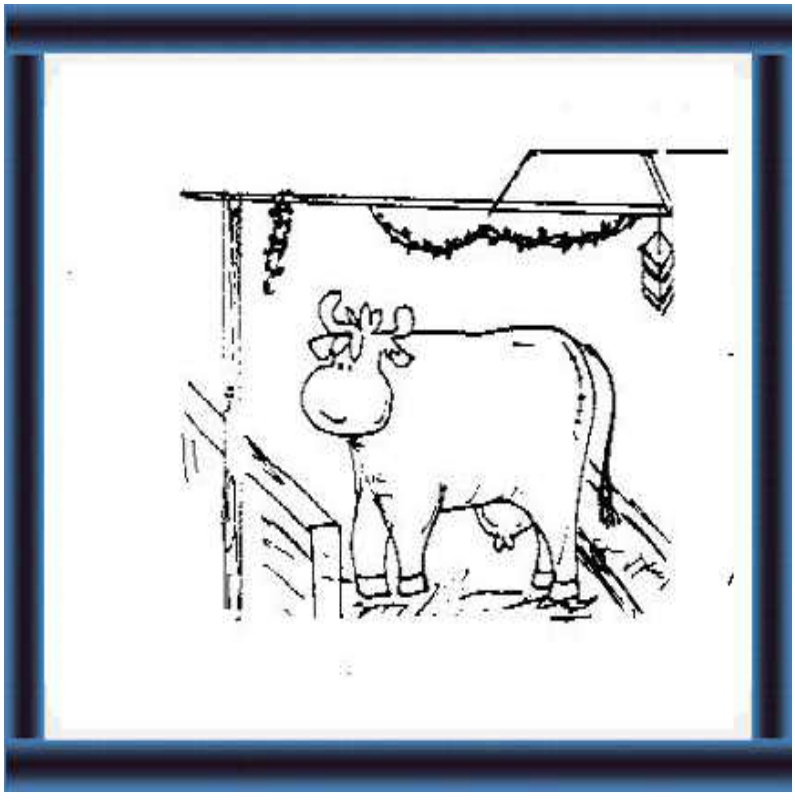


37 **Flies** make your cows **uncomfortable**.
Stress can **reduce milk** production.

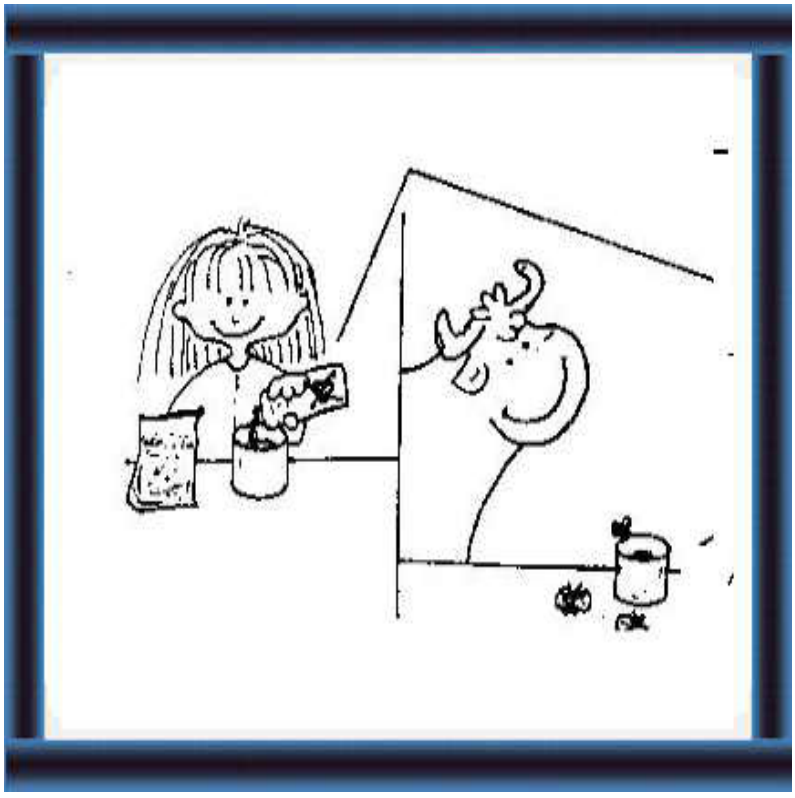
38 Your cows are **difficultto milk** when **flies disturb** them.



39 **Reduce fly breeding** by:
- proper disposal of wastes
- keeping sheds clean.



40 Flycatching strips or flypaper **improve** the **conditions** for your cows.



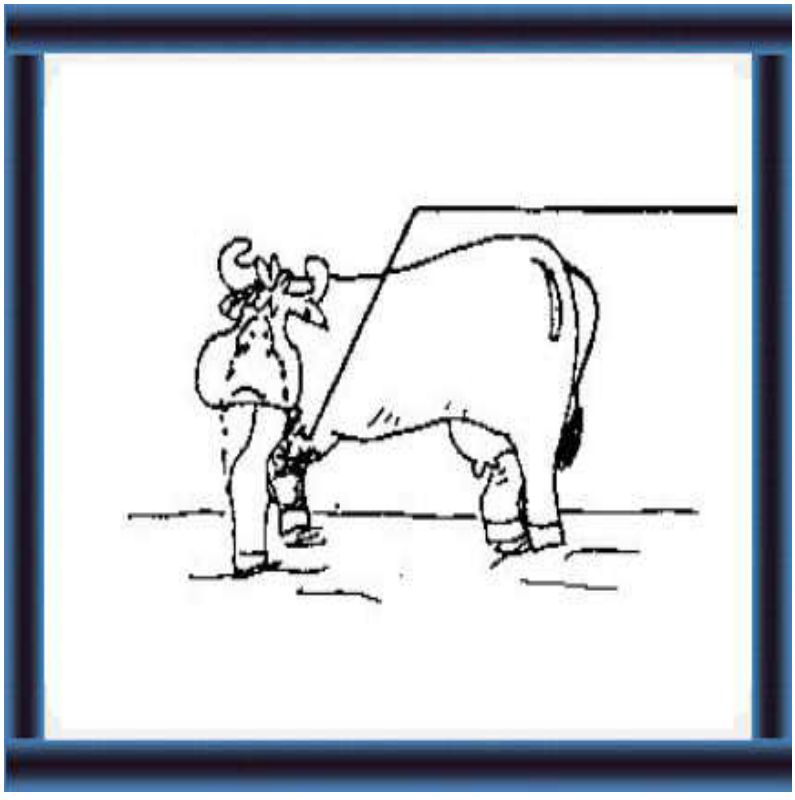
41 Mix sugar with an appropriate insecticide and place in a small tin.
This will attract the flies and kill them.

42 **Protect** your cows from flies by using **flyproof netting** round the shed.

How can you improve safety?

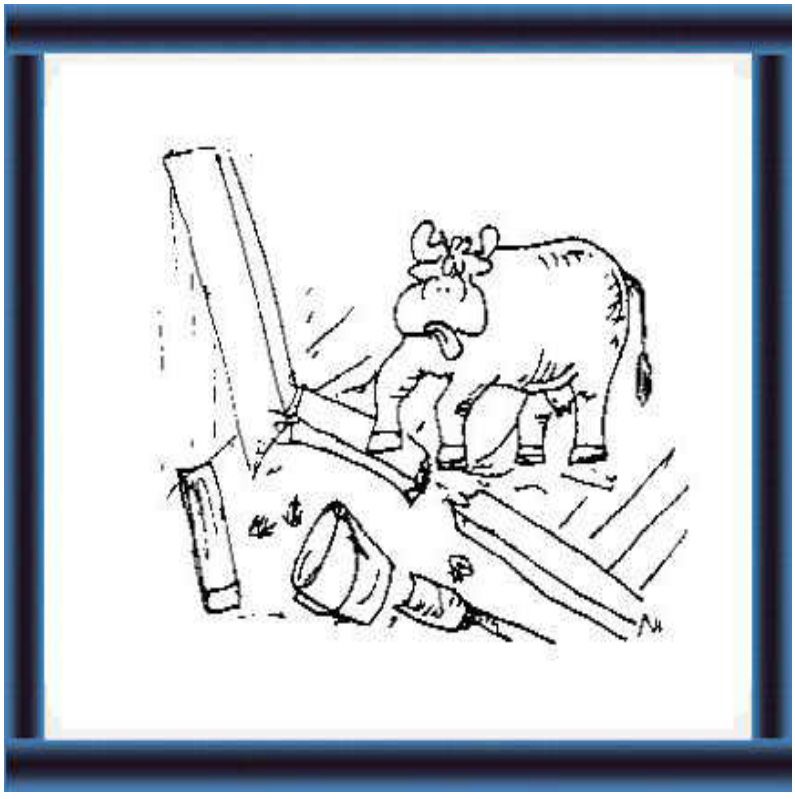
43 Your cows **cannot move easily** on **slippery** floors. They become **scared of walking**.

44 They **hurt** themselves when they fall.



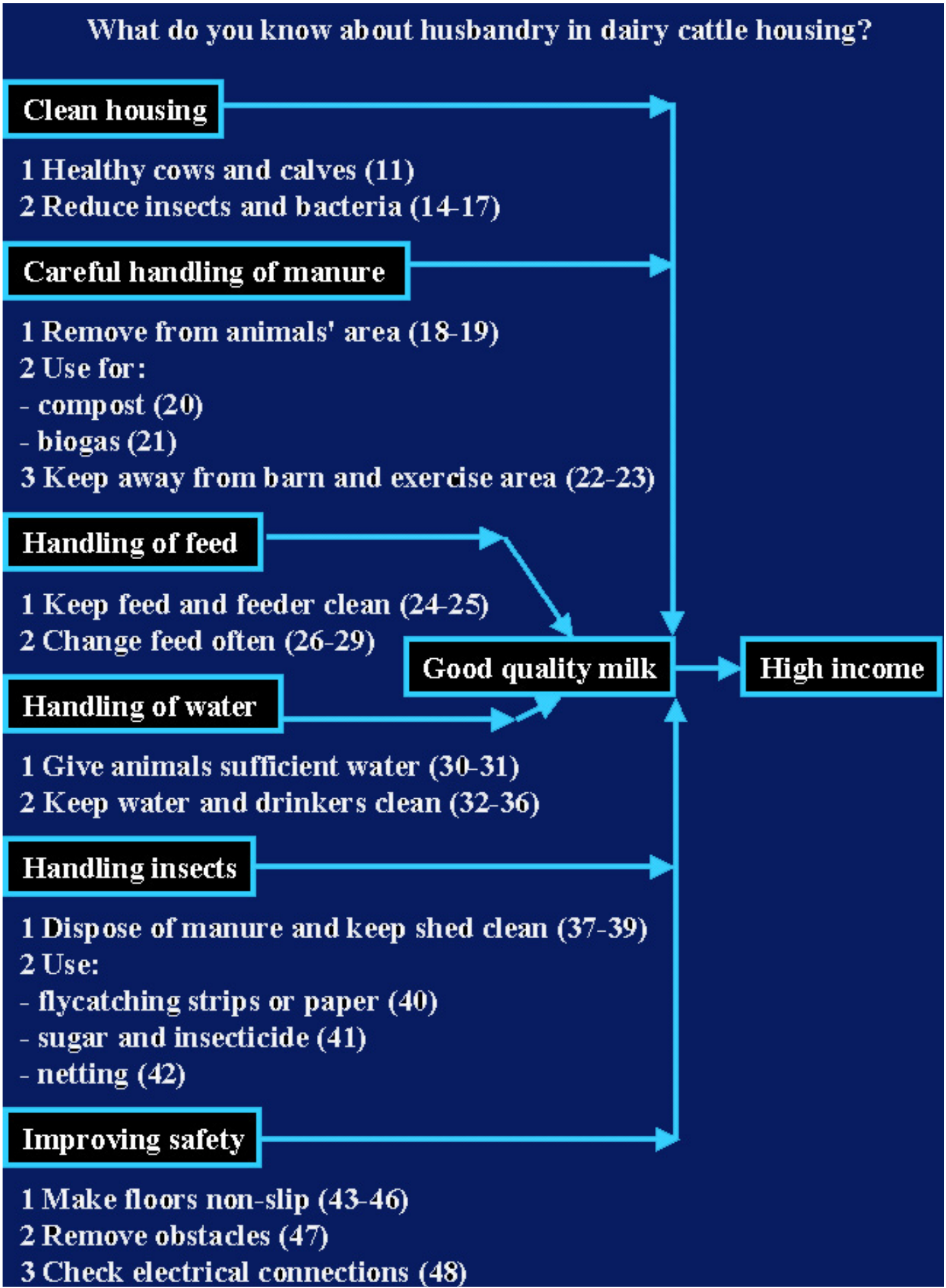
45 They can **break** their **legs** and then you have to **slaughter** them.

46 **Make floors safe** so that it is **easy** for cows **to walk** on them.



Make sure:
47 Your exercise area is **free from** anything which can **injure** your animals.

48 The **electrical connections** are **safe**.
A **good living environment** for your cows gives a **good income** for you in return.



(11) (14-17) (18-19) (20) (21) (22-23) (24-25) (26-29) (30-31) (32-36) (37-39) (40) (41) (42) (43-46) (47) (48)

3 Check electrical connections (48)