

# **Small-scale dairy farming manual**

## **Vol. 4**

Regional Dairy Development and Training Team  
for Asia and Pacific  
Chiangmai, Thailand

Regional Office for Asia and the Pacific  
Bangkok, Thailand

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## TABLE OF CONTENTS

### Volume 4

<a href="#">Husbandry Unit 6.1</a> -	<a href="#">Artificial Insemination (A.I.) In Dairy Buffalo and Cattle</a>	<a href="#">i</a>
<a href="#">Husbandry Unit 6.2</a> -	<a href="#">Breeding Calenders</a>	<a href="#">49</a>
<a href="#">Husbandry Unit 7.1</a> -	<a href="#">Physiology of Milk Production</a>	<a href="#">87</a>
<a href="#">Husbandry Unit 7.2</a> -	<a href="#">Milking and Handling of Milking Equipment</a>	<a href="#">109</a>
<a href="#">Husbandry Unit 7.3</a> -	<a href="#">Milk Recording</a>	<a href="#">141</a>
<a href="#">Husbandry Unit 8</a> -	<a href="#">Calving</a>	<a href="#">161</a>
<a href="#">Husbandry Unit 9</a> -	<a href="#">Calf Rearing</a>	<a href="#">197</a>

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# Small-Scale Dairy Farming Manual

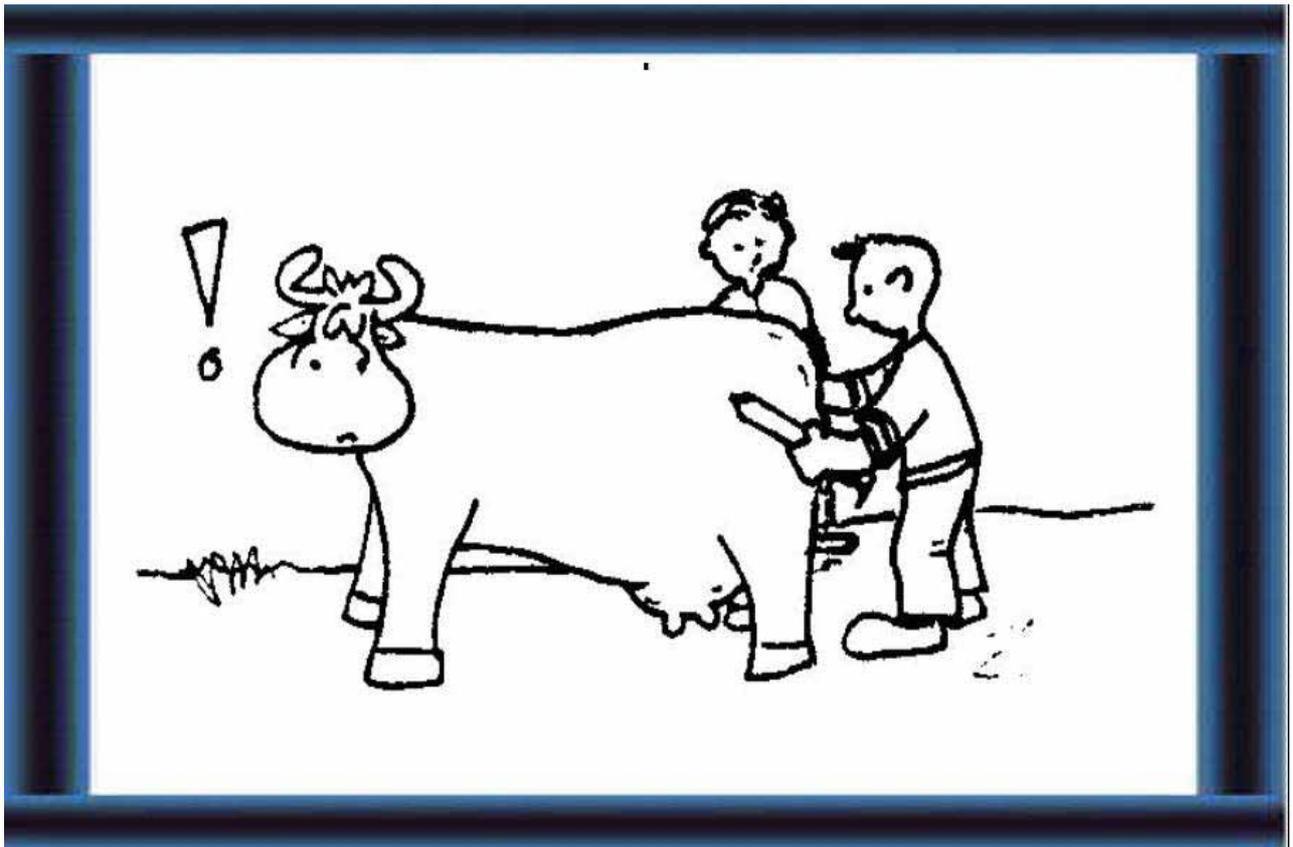
## Volume 4

### Husbandry Unit 6.1

## **ARTIFICIAL INSEMINATION (A.I.) IN DAIRY BUFFALO AND CATTLE**

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page 1



## ARTIFICIAL INSEMINATION (A.I.) IN DAIRY CATTLE AND BUFFALO

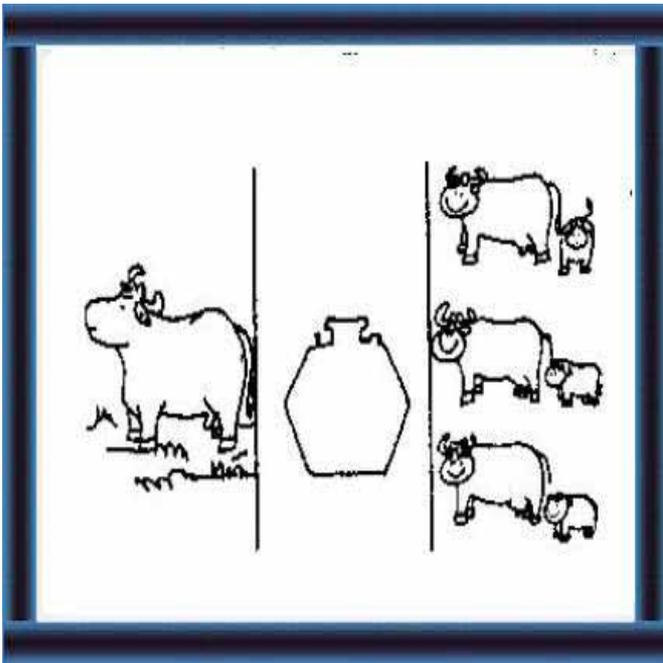
### Husbandry Unit 1.1:

Technical Notes

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

## Extension Materials

What should you know about A.I.?



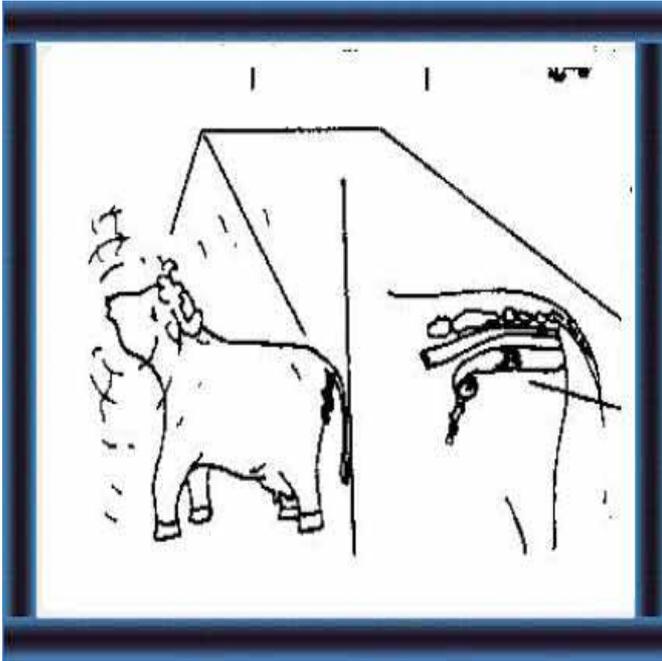
What is A.I. and why use it? (5-20)

1 A.I.:

- passes semen from a bull to a cow **without direct contact**

- helps you get **more calves** from good bulls.

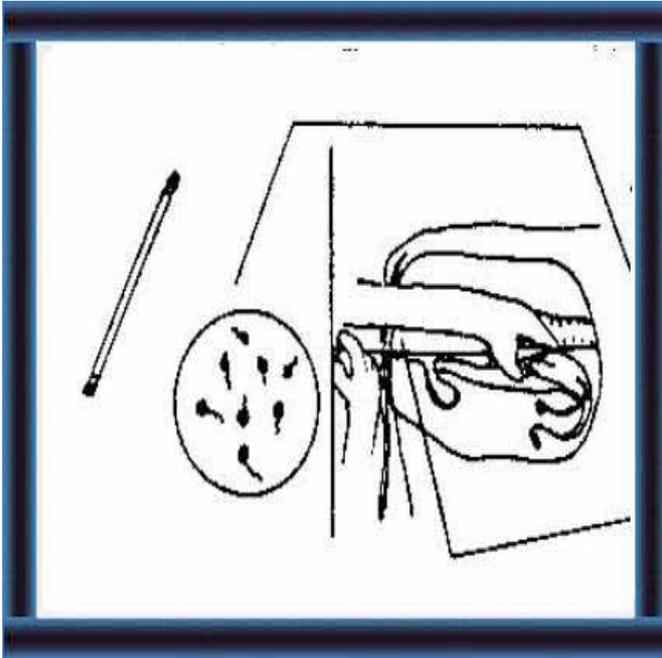
How does your cow show heat and how do the female reproductive organs work?



(21-46)

2 You should know:

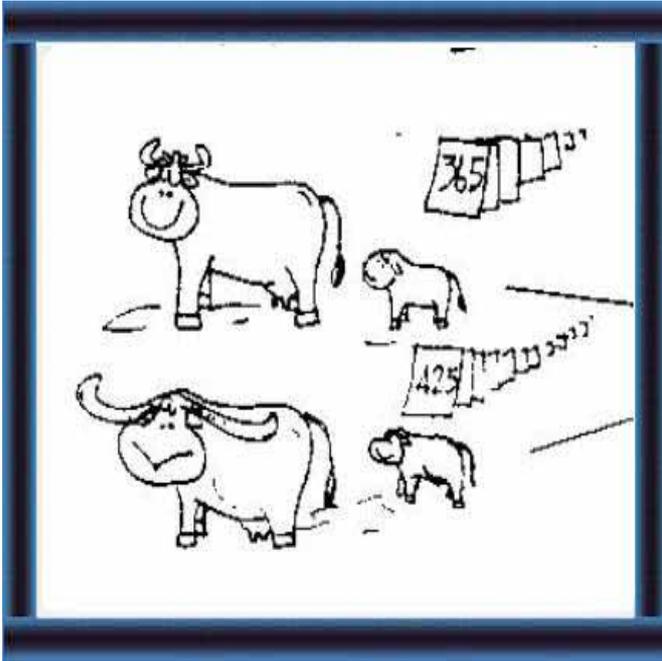
- all the **heat signs**
- the names of the reproductive organs
- what the reproductive organs do.



How does the A.I. technician inseminate your cow? (47-56)

3 He **prepares the semen** and uses a **breeding gun** to inseminate your cow.

How often should your dairy cow calve and are there any differences for buffalo? (57-69)



4 Dairy cattle should calve every 365 days.

Buffalo should calve every 425 days.

page 3

## What is A.I.? (5-8)

**A.I. stands for "Artificial Insemination". A.I. is different from natural mating. In A.I. semen is collected artificially and deposited in the uterus of the cow. A.I. is widespread and used in many countries, especially for breeding dairy cattle.**

page 4

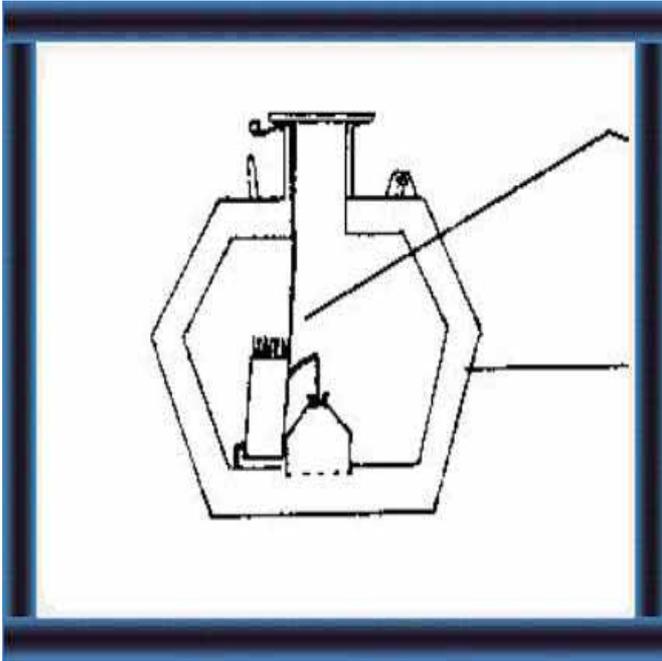
What is the difference between A.I. and natural mating?



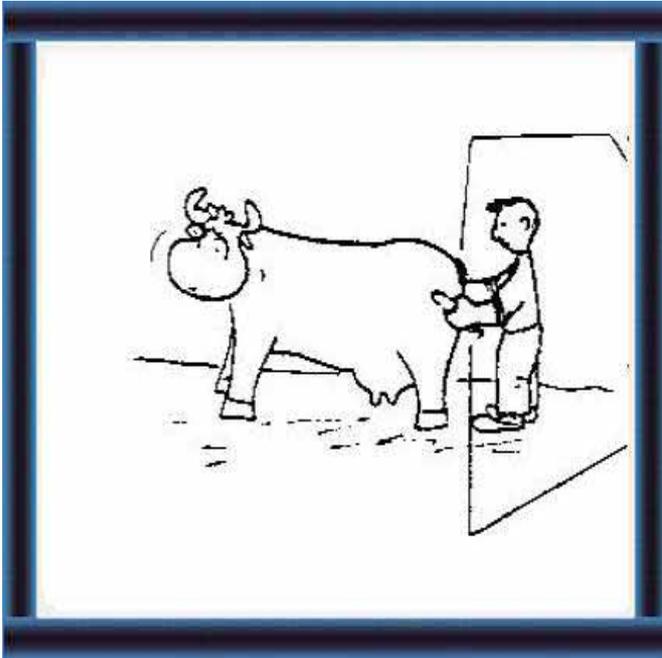
5 In **natural mating** a bull mounts a cow and ejaculates his semen into her vagina.



6 In **artificial insemination (A.I.)** the A.I. technician collects semen from a bull in a bag called an **artificial vagina**.



7 He keeps the **semen frozen** in a **special container** until you need it for your cow.



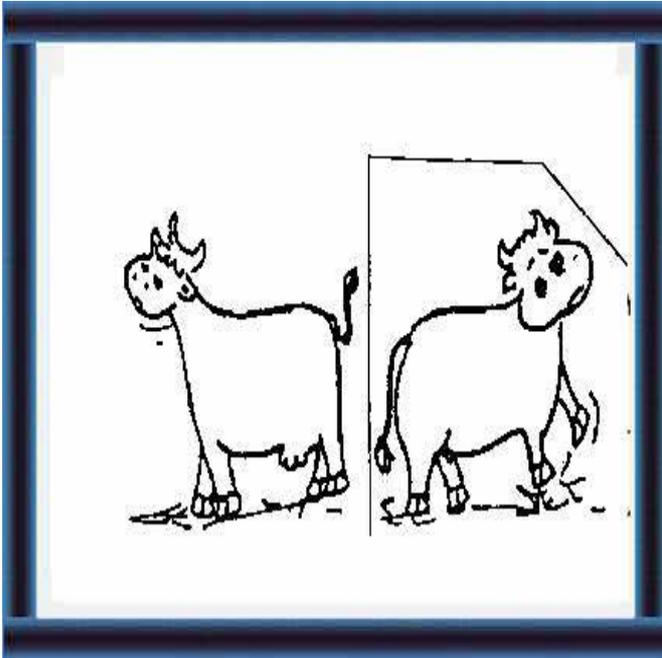
8 When the cow is **in heat**, the A.I. technician **inseminates** the cow with a **breeding gun** (insemination rod).

## Why Use A.I.?

### Important reasons for using A.I. are:

- **No direct contact between bull and cow.** This reduces the risk of transfer of disease and of injuries from natural mating. (9)
- **One portion of semen (ejaculate) from one bull can be divided into enough doses to inseminate 200-250 cows.** In natural mating, one bull can serve only about 30 cows per year. **A.I. transfers the genes from a good bull to a large number of offspring and breed improvement takes place much more quickly than in natural mating.** (10-12)

### Why use A.I.?

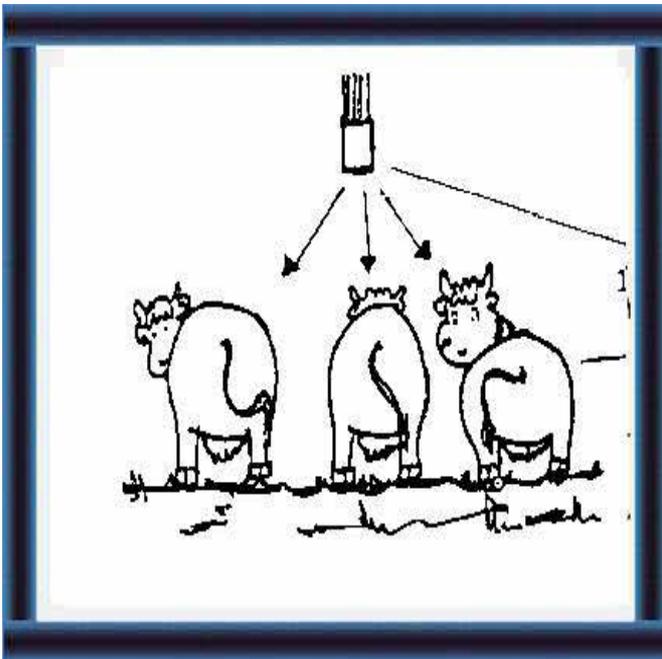


9 Artificial insemination of dairy buffalo and cattle has **many advantages**:

**No direct contact** between bull and cow.

This means:

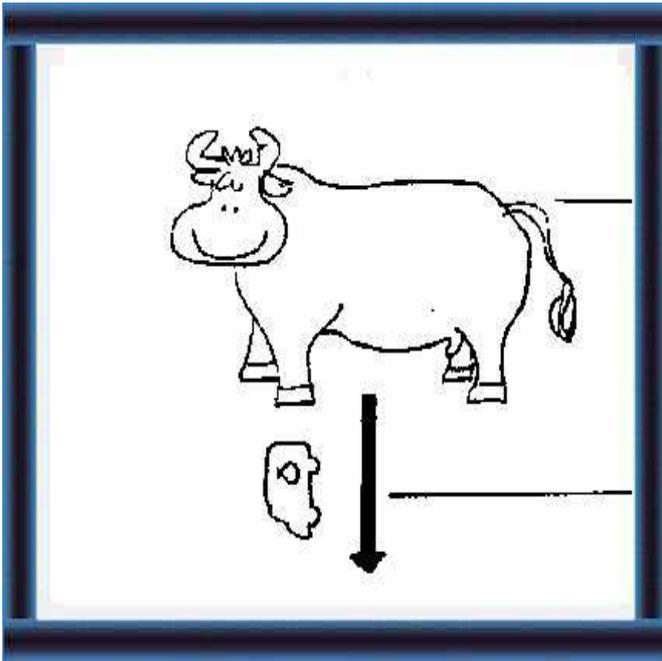
- **less disease** transferred
- **fewer injuries** from mating.



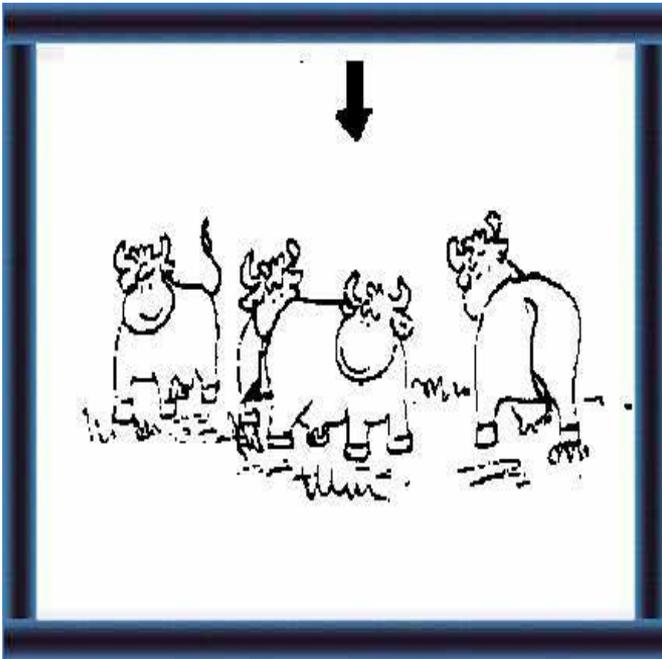
10 **Semen** from one bull can be used for inseminating **many cows**.

This means:

- **more calves** from good bulls.



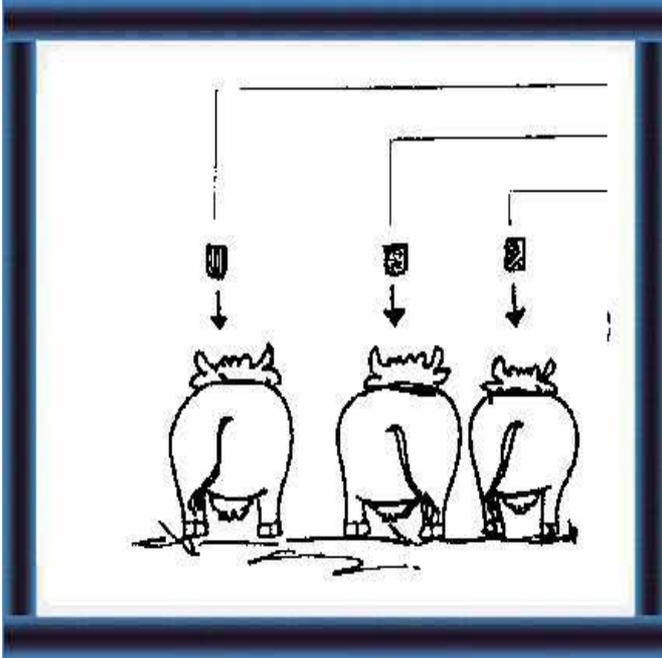
11 You can take semen from a **bull in one place**



12 and transport it to **cows in other places**.

**3. A.I. technicians use semen from different bulls even in small herds. This allows the farmer to choose his own breeding policy. (13)**

**4. Depending on local conditions, A.I. costs may be lower than the costs of keeping a herd bull. (14-15)**



13 Even in **small herds**, you can use semen from **different bulls**.

This means:  
- you can produce the **crossbreeds** you want.



**Remember:**

**Natural breeding**  
14 It is **expensive** to keep a **herd bull**.



**Artificial insemination**

15 A.I. may be **cheaper** than keeping a herd bull.

page 9

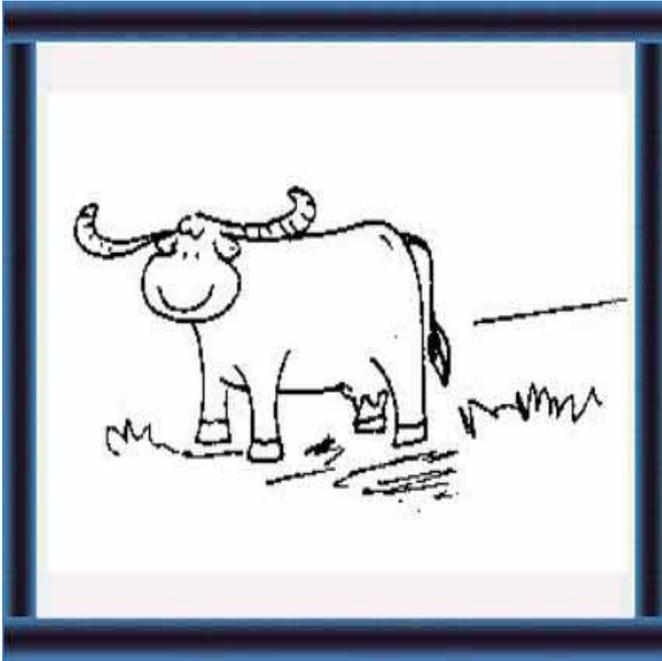
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**The use of A.I. for riverine (e.g. Nili-Ravi) and swamp buffalo is limited for two main reasons:**

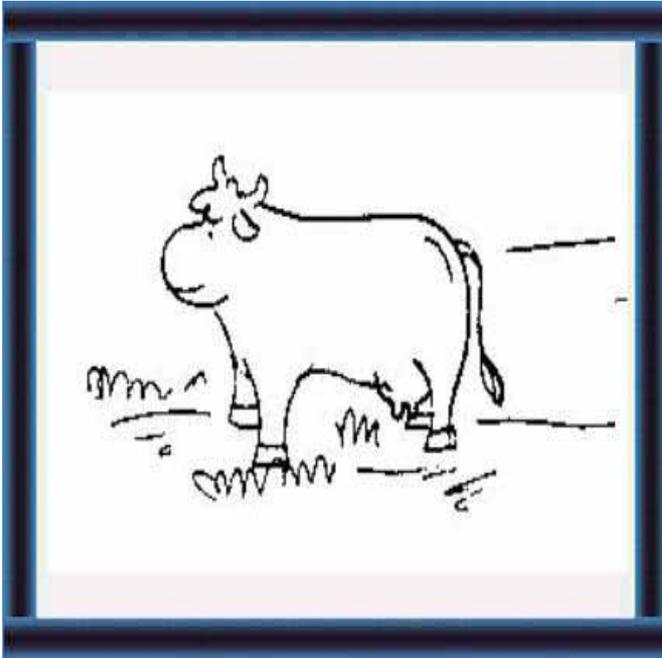
- 1. A.I. is not available.**
- 2. Faulty techniques for A.I.**

page 10

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16 As well as dairy cattle, **A.I. is suitable** for both **Swamp buffalo**



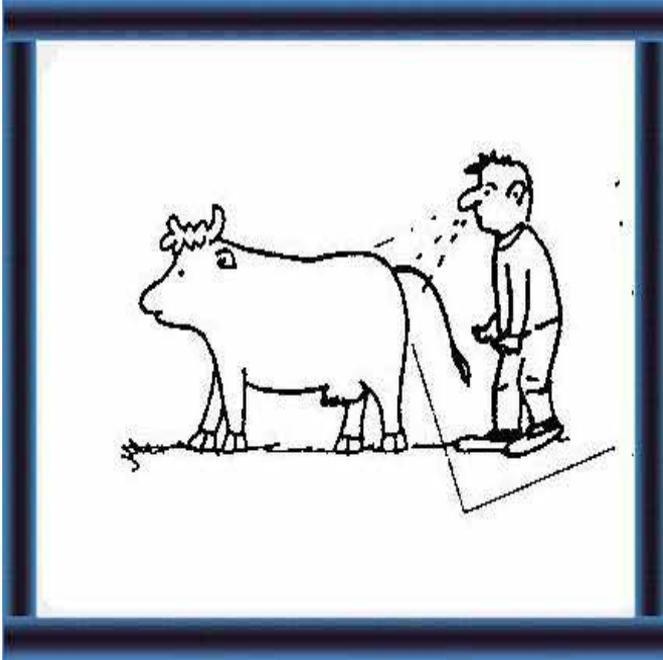
17 and **River buffalo**.

If you have difficulty:  
- consult your A.I. worker  
- make sure he is **qualified**.

## **Disadvantages of A.I.**

- **The A.I. system will only work well if the management of the farms is efficient, in particular the farmers' ability to perform heat observation. (18)**
- **The regular use of A.I. in a certain area requires a well organized A.I. system with continuous recording and monitoring and well trained A.I. personnel (inseminators).**
- **Semen may transfer undesired heritable traits and infectious diseases. The A. I. technician must use only checked semen taken from a bull which has been tested not to transfer undesired traits and not to carry and diseases transferable by semen. (20)**

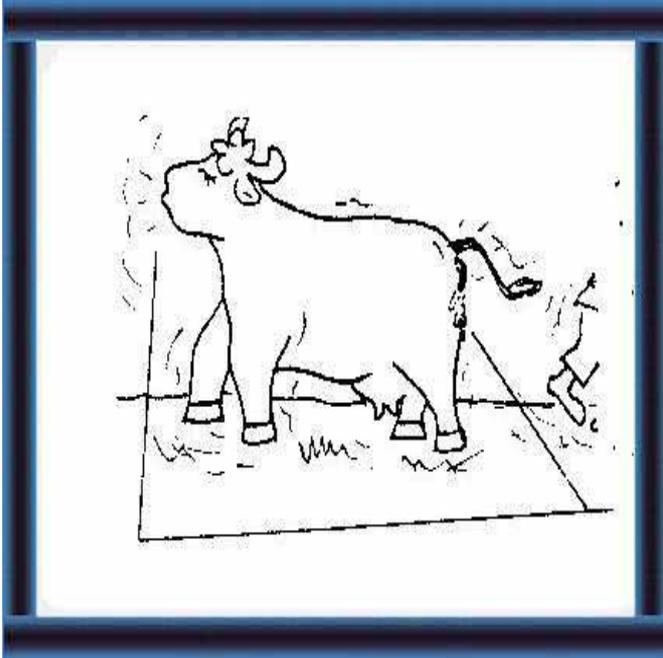
**Things to remember in A.I.**



**Make sure:**

18

- you are **able and ready to observe signs of heat** in your cow



19

- you can call the A.I. technician **quickly** when your cow shows signs of heat



20  
- you use an A.I. technician who is **well trained**.

page 13

## Heat observation

**A non-pregnant cow with a normal oestrus cycle will release an egg and show heat about every 21 days (variation: 18-24 days).**

**The typical signs of heat are:**

- 1. Restlessness, the cow separates from other cows when it is walking in the field. (21)**
- 2. Some breeds bellow to attract the bull. Zebu (=native) cattle, however, normally do not bellow. (22-23)**
- 3. Milk production and food intake may decrease. (24)**

page 14

**How does your cow show heat?**



21 About **every 21 days** non-pregnant cows are ready for breeding.

They show **signs of heat**. The heat period lasts about **18-20 hours**. Signs of heat include **restlessness** and **separation** from other grazing cows.



22 The cows of some breeds of dairy buffalo and cattle **bellow** to attract the bull.

23 Some cows of certain breeds of dairy



cattle (e.g. Zebu) and dairy buffalo (e.g. Nili-Ravi) do not bellow.

They have **silent heat**.



24 Food intake and milk production may **decrease**.

page 15

**4. The cow tries to mount other animals, sniffs at others, and other cows sniff at the cow in heat. (25-26)**

**5. Other cows try to mount the animal in heat and she stands and allows them to do so: standing heat. (25-26)**

**6. The lips of the vulva become red and swollen. (27)**

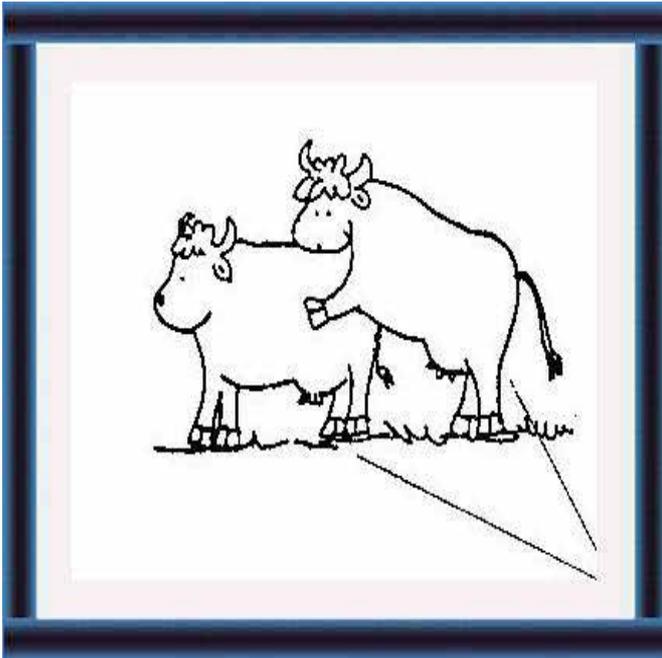
**7. A thin, clear discharge from the vulva opening can be seen, sometimes sticking to the tail and skin surroundings. (27)**

**8. By rectal palpation increased uterus tonus can be felt.**

**Extra care in heat observation needs to be taken with buffalo cows. Many of them: (28-9)**

- Show very poor signs of heat and may have silent heat.
- Come on heat late at night when the signs are more difficult to detect.

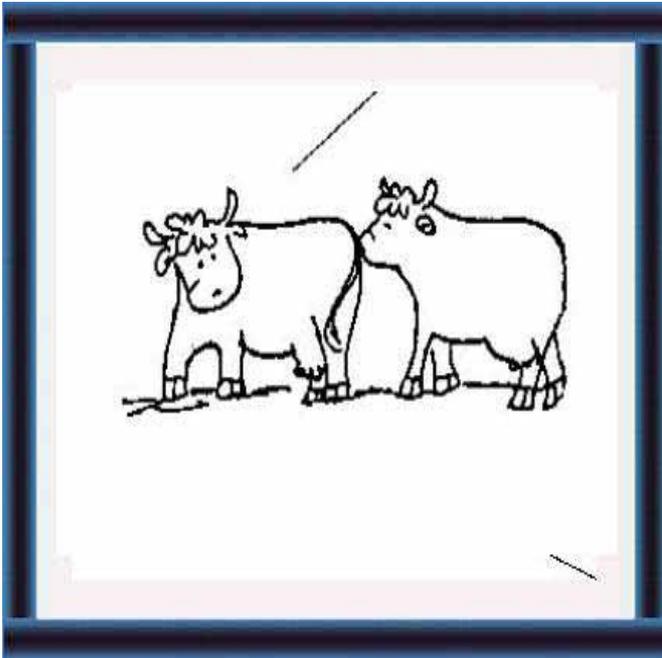
page 16



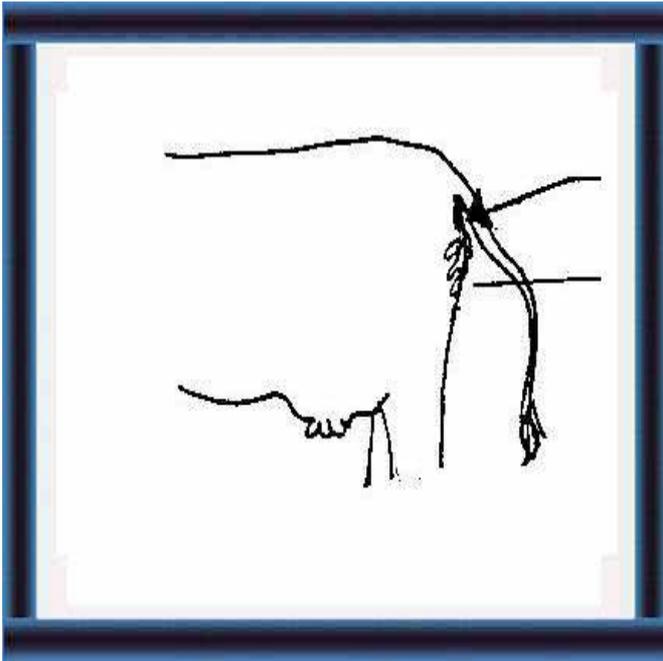
25 The cow in heat tries to **mount other cows**.

The cow in heat **allows** other cows to **mount her**.

This is called **standing heat** and is **important** to notice.



26 Other cows **sniff** the cow in heat.



27 The lips of the vulva become **red and swollen**.

You may see a **thin sticky clear discharge** like egg white.

This runs from the vulva and may stick to the tail and skin.

page 17



28 Buffalo cows often show **poor signs of heat** and have **silent heat**.

You must **observe carefully**.



29 Buffalo often show signs of heat **late at night**.

You should check them at this time.

page 18

**Normally, the farmer will not see all signs of heat at the same time. Some signs of heat may be absent or too weak to be observed. (31)**

**The standing heat period normally lasts 18-20 hours, but may be several hours shorter or longer. (33)**

**For the inseminator it is important not only to question the farmer about previous inseminations, treatments and proper heat signs but also to check by himself that the cow to be inseminated:**

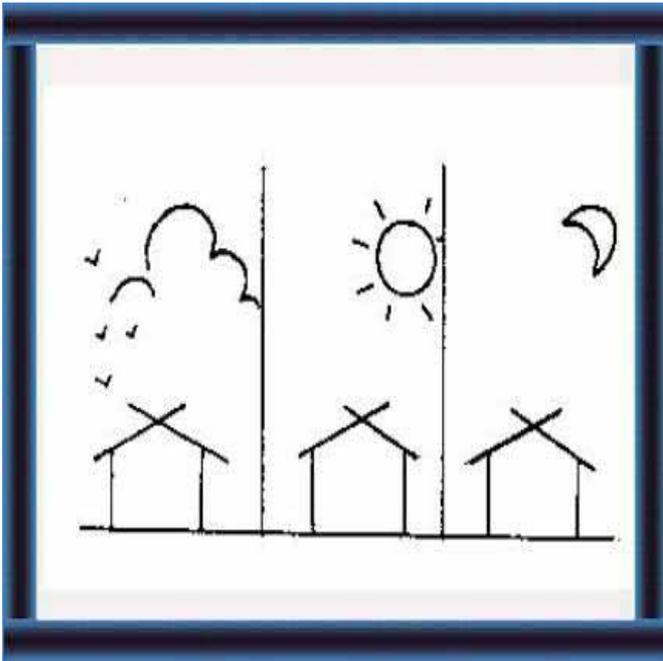
- 1. Really is in heat: insemination of cows not in heat easily causes infection of the uterus (metritis, pyometra).**
- 2. Has no reproductive disease (especially uterus infection), in which case insemination is not likely to succeed.**
- 3. Is not pregnant already: insemination of pregnant cows results in abortion.**

### **Timing of insemination**

**The best possibility for getting a cow pregnant is when insemination is done in the last half of the standing heat period or within 6-8 hours after the end of the standing heat period. (33-38)**

page 19

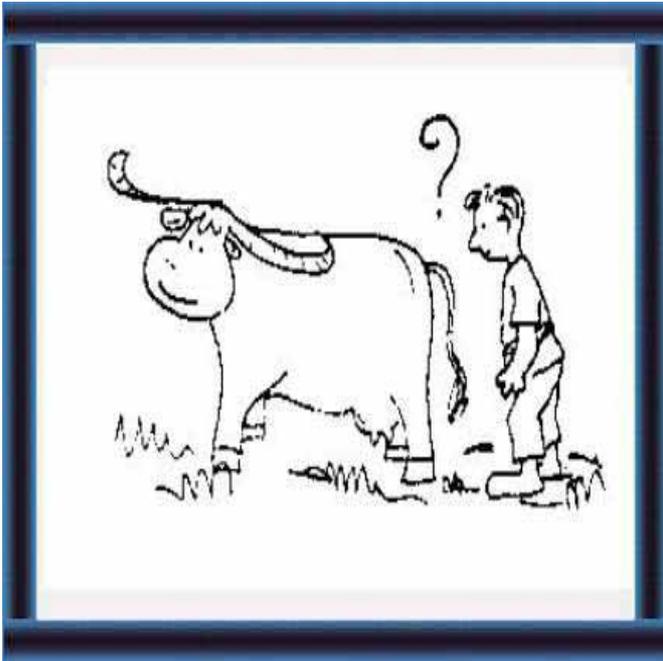
**Important**



30 The heat period is **short**.

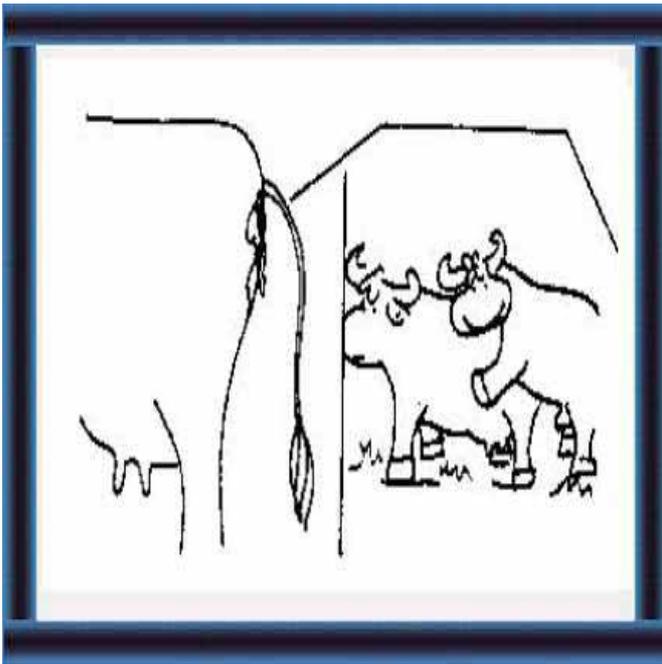
Be ready to observe:

- **early morning** before milking
- **afternoon** before milking
- **before going to bed**.



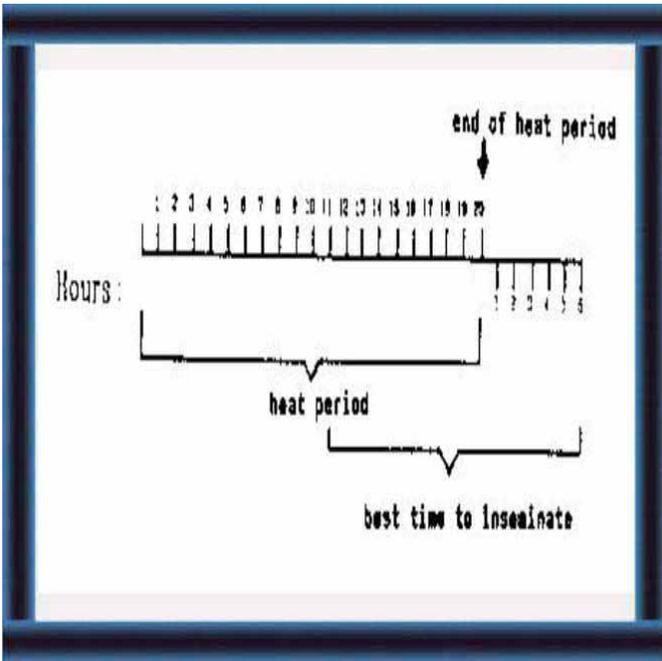
31 You may **not** see some heat signs **at all**.

32 Look out for the **typical discharge** and



for **standing heat**.

**Your cow is in heat. When do you inseminate?**

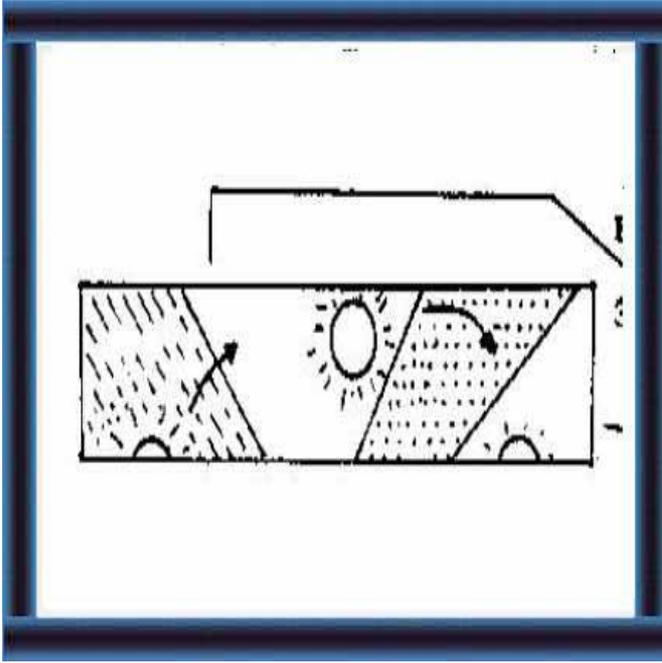


33 Inseminate the cow **towards the end** of the **heat period** or at latest **within 6 hours** of the end of the heat period.

**The normal working routine to follow is:**

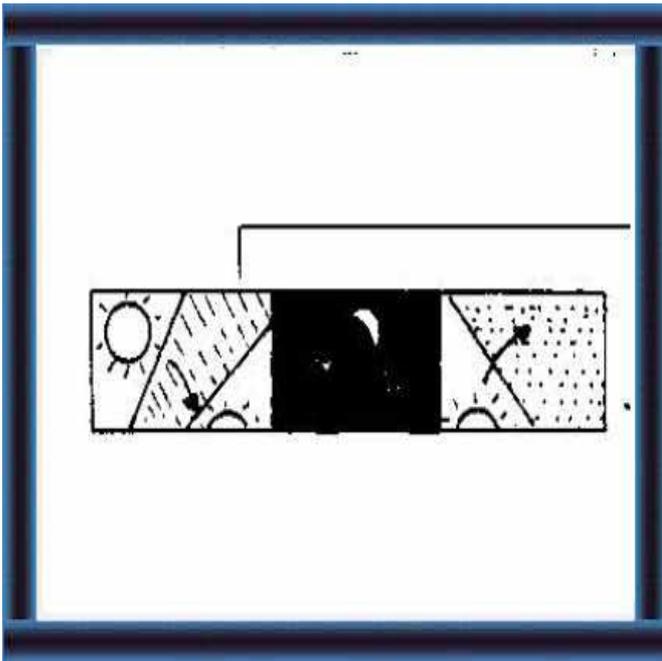
- 1. If the farmer observes heat early in the morning, inseminate in the afternoon of the same day. (34)**
- 2. If the farmer observes heat in the afternoon, inseminate early next morning. (35)**

**Easy rule:**



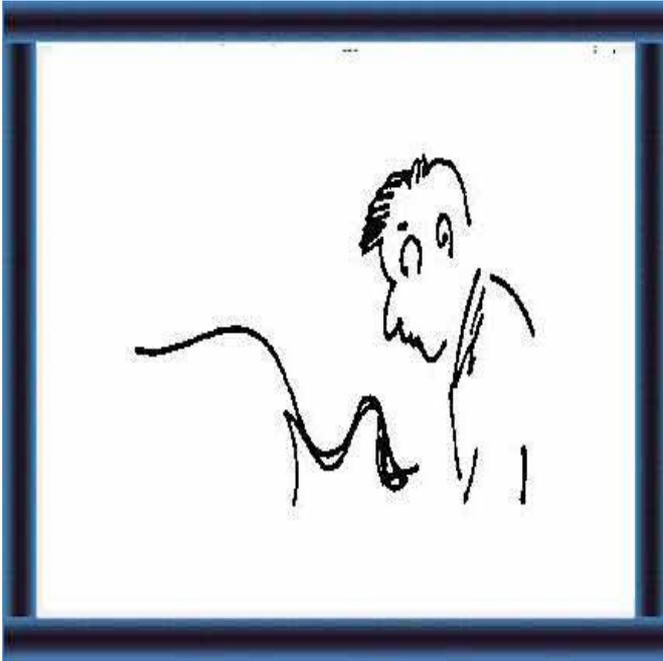
34 Heat signs **early** in the **morning**.

Inseminate in the **afternoon** - **same day**.



35 Heat signs in the **afternoon**.

Inseminate in the **morning** - **next day**.



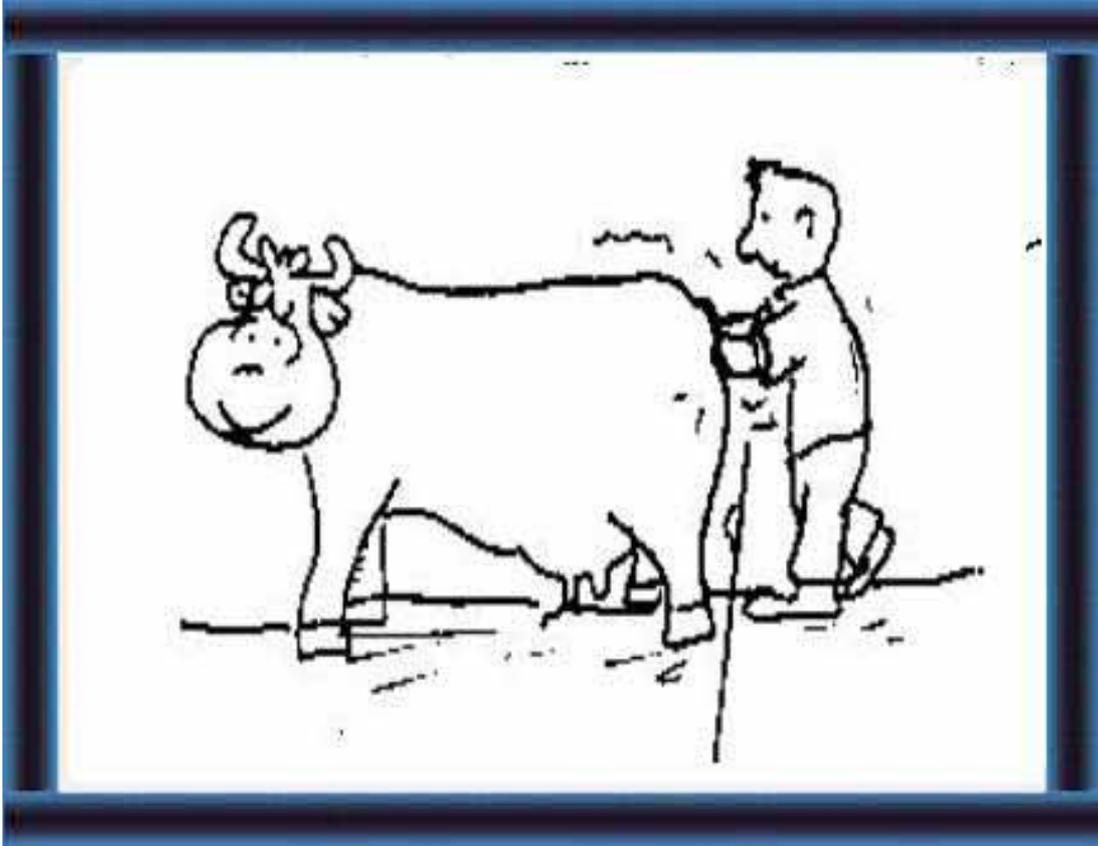
**Remember:**

36 Look **carefully** for signs of heat.

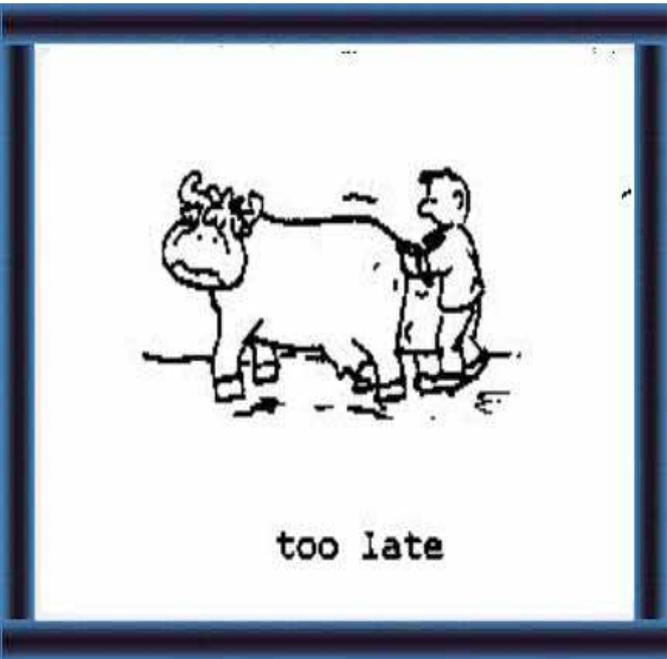
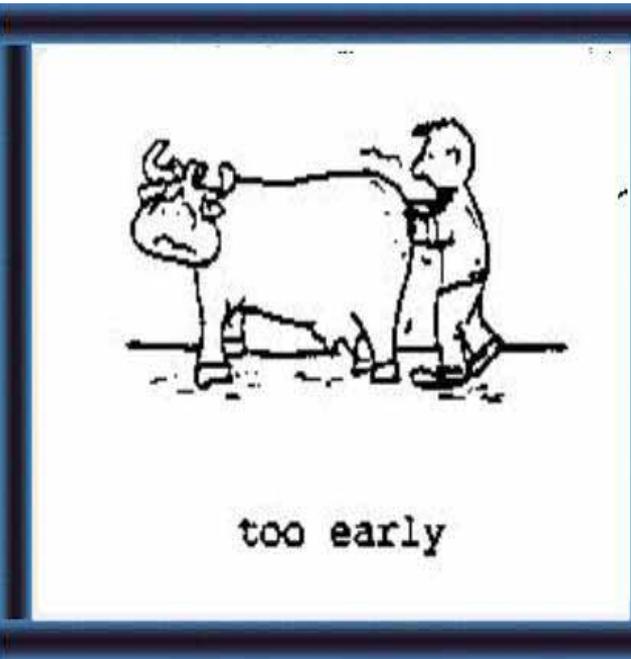
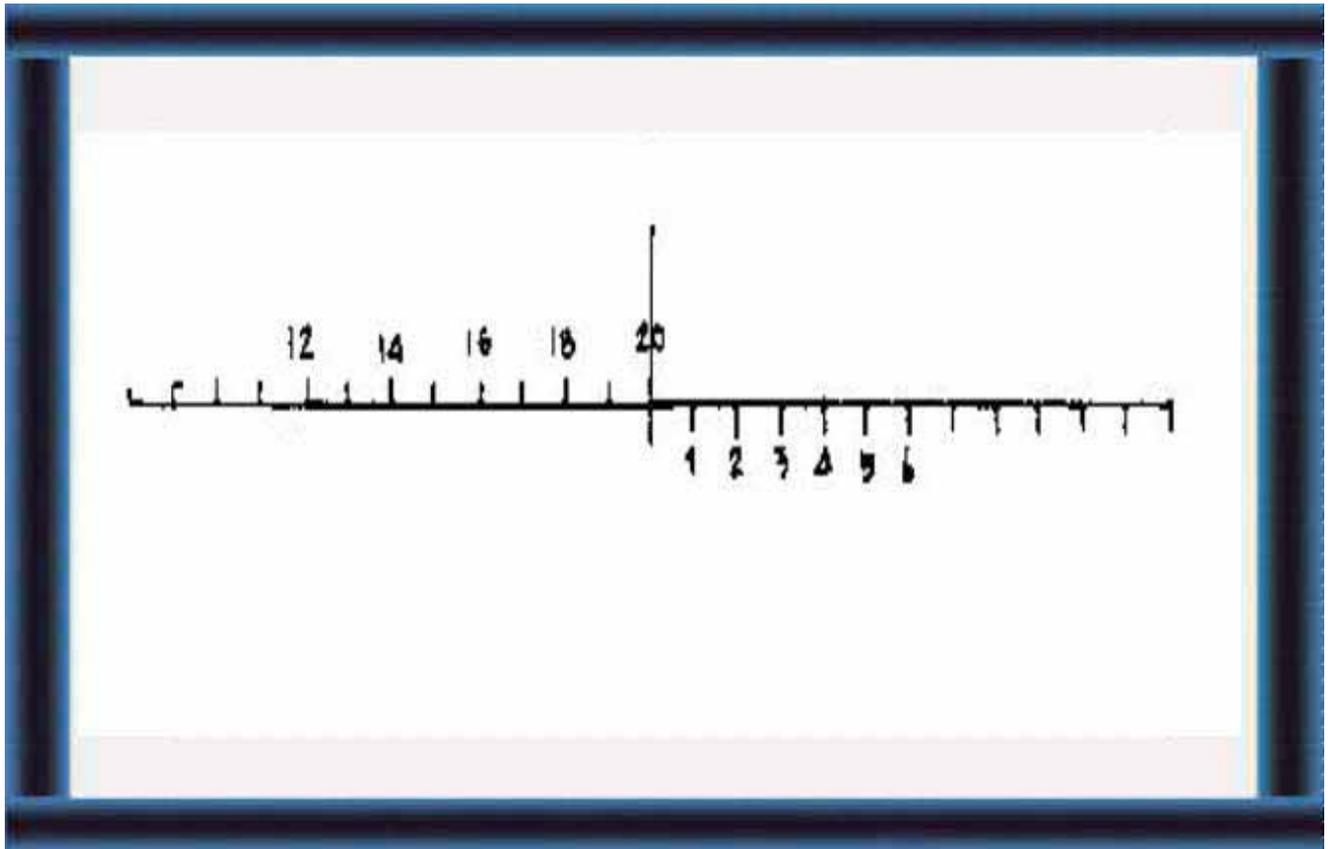


37 Inform the A.I. technician **quickly**,  
**within 3-5 hours** of observing heat.

**Fertilization, that is the combining of egg and sperm, takes place when the egg reaches the egg duct. If the A.I. technician performs the insemination too early, the sperm deposited in the cow dies before the egg reaches the egg duct. If he performs the insemination too late, the egg dies before the sperm is deposited. Therefore, neither too early and too late inseminations will result in pregnancy. (38)**



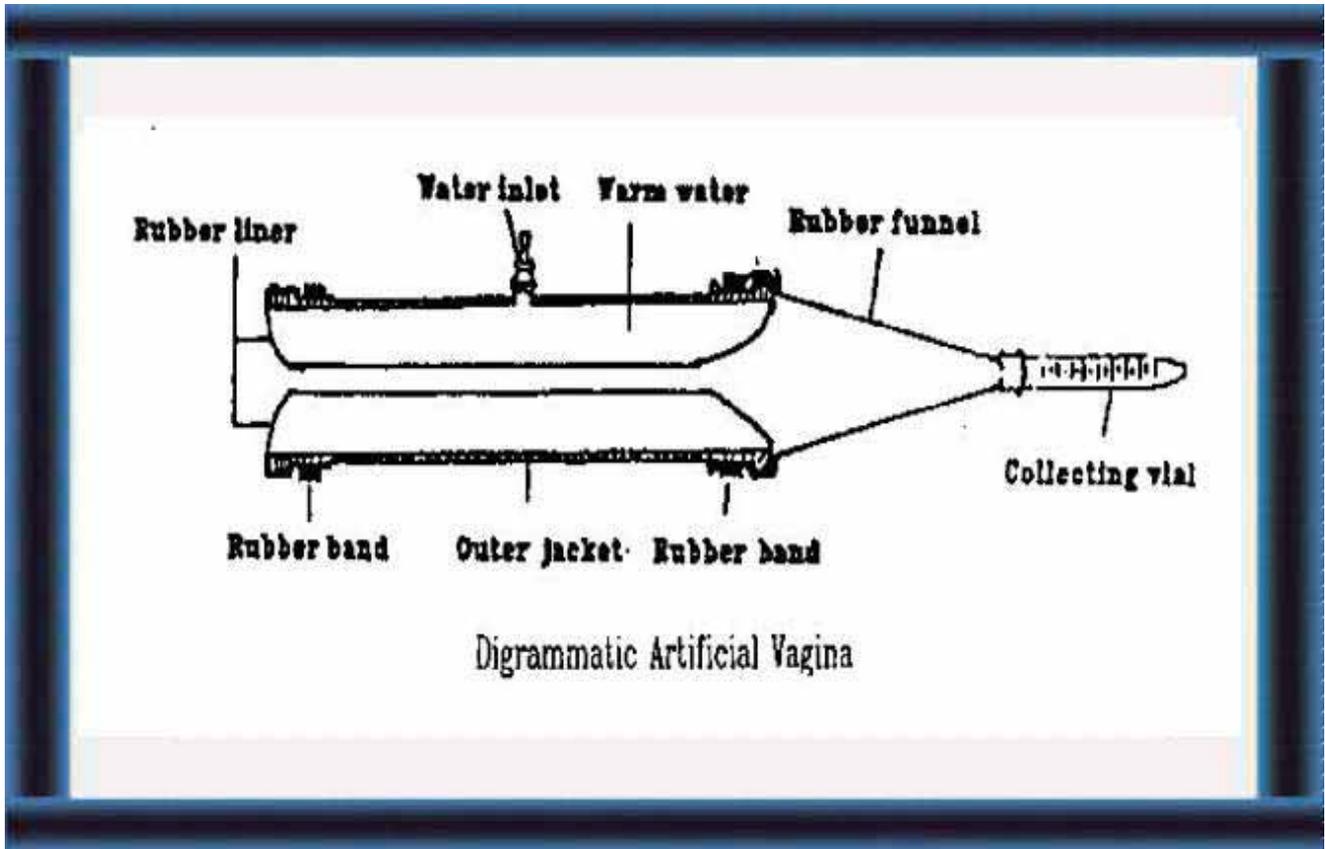
Inseminate at the **right time:**  
at **end** of the **heat period:**  
- your cow **should get pregnant.**



**Too early** or **too late:**  
- your cow will **not get pregnant.**

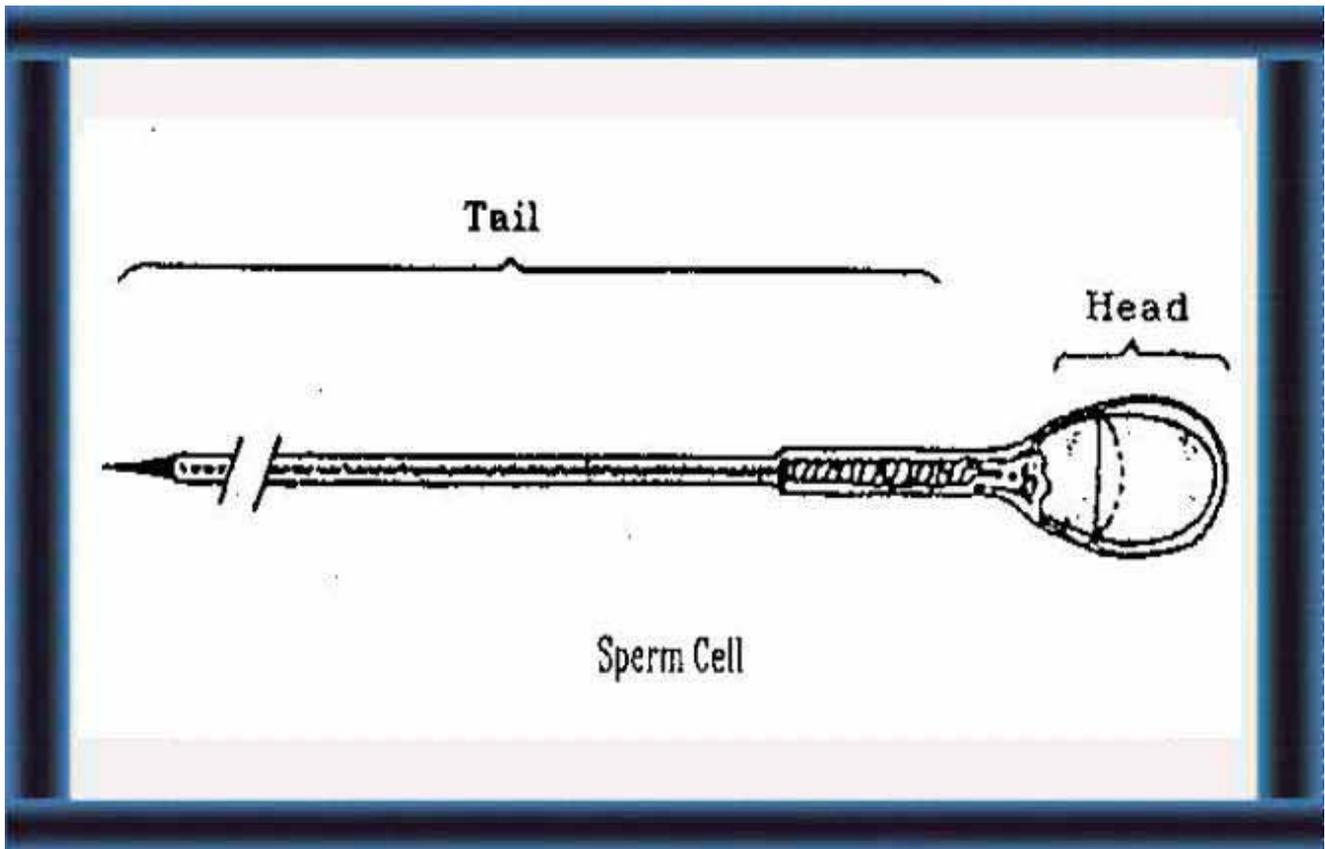
## How do A.I. Technicians collect, process and handle semen?

A.I. technicians collect semen only from tested sires, normally by using an artificial vagina. (39-42)



They clean and sterilize the artificial vagina every time it is used and store it in a clean and dustfree place. When in use, A.I. technicians keep the inner wall of the artificial vagina at 40-45 C.

The bull mounts a "teaser" animal or a "dummy", and ejaculates into the artificial vagina held by the A.I. technician who collects the semen in a vial. After collection, he judges the quality of the semen by looking at semen volume, colour, consistency, mass motility (that is: overall movement observed in the microscopy, "waves"), individual motility of sperm cells and semen morphology (that is: normal/abnormal looking cells). (41)



**A.I. technicians use only semen of good quality for further processing. This includes freezing in liquid nitrogen at -196 C in straws, marked for identification. They check the semen for quality again before distributing to the field.**

page 25

## **How good is semen in A.I.?**

39

**Is the semen clean?**

**Yes**, the semen is collected in an **artificial vagina** which is **clean** and **free from germs**.

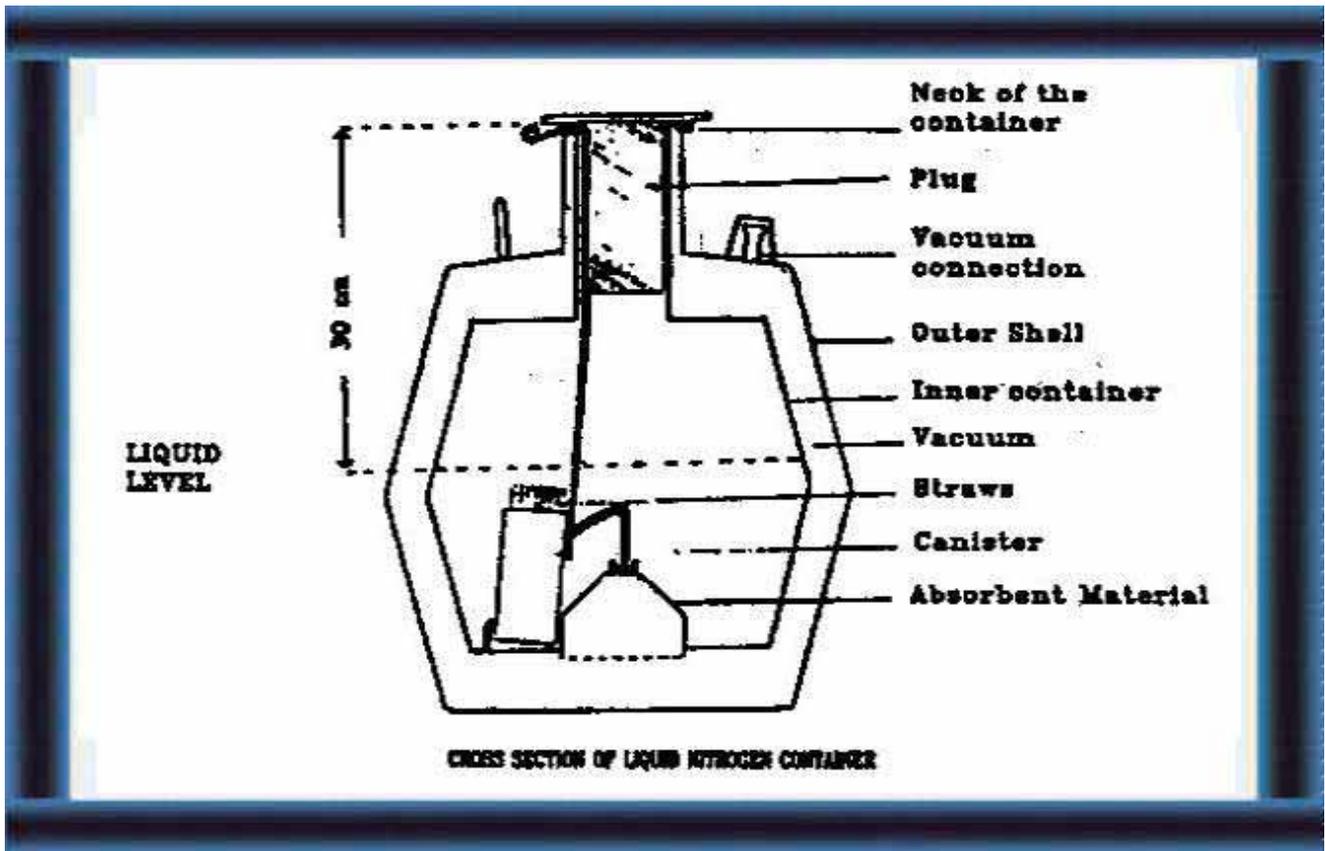
**Is the semen free of disease and of good quality?**

**Yes**, it is carefully **tested** for **quality** and taken only from **healthy animals**.

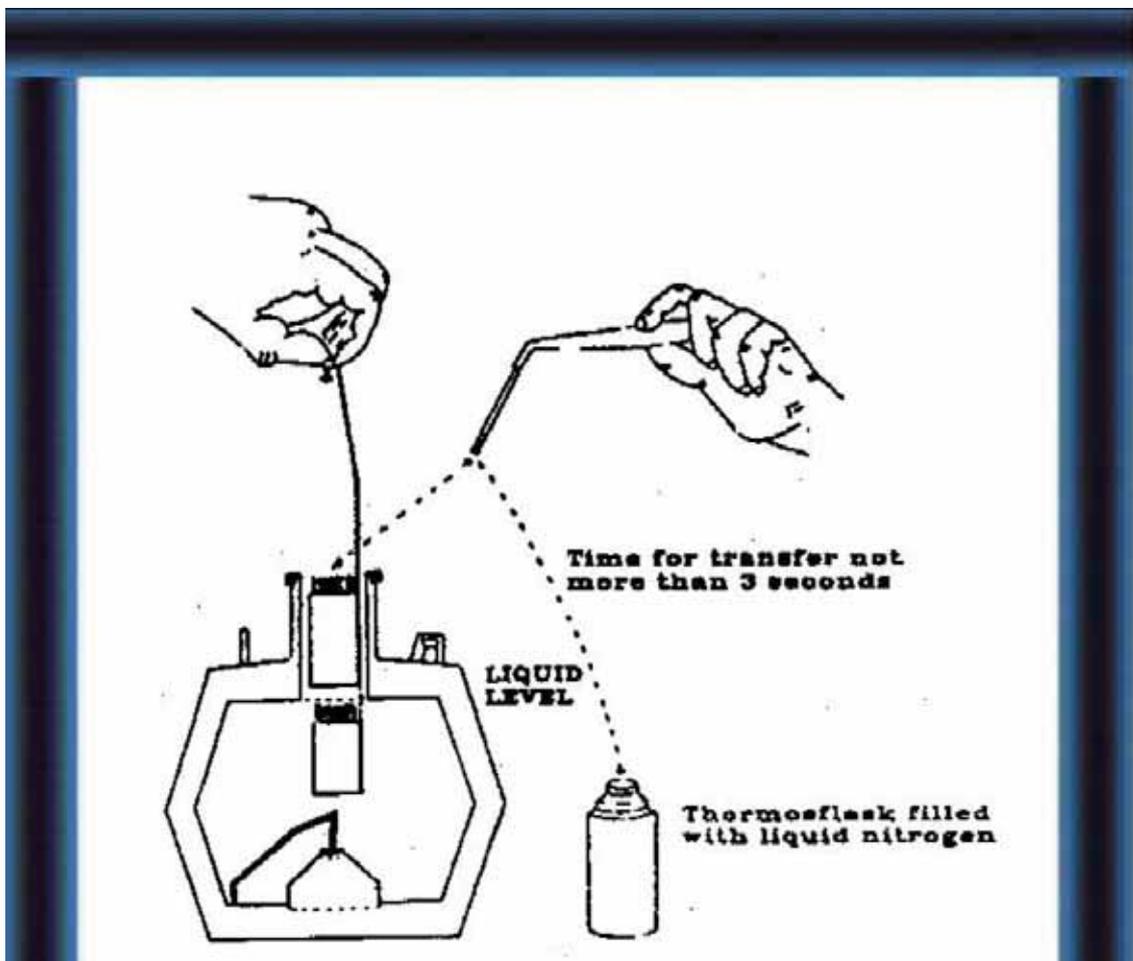
**Is the semen still good after storage and transportation?**

**Yes**, it is **frozen** and stored at - 196 C and kept in **special containers**.

In the A.I. centres, they keep the semen frozen in liquid nitrogen containers at -196 C.



The A.I. technicians must keep the straws under the liquid level and must not lift them up into open air for checking number and colour, the temperature change will immediately destroy the semen cells.



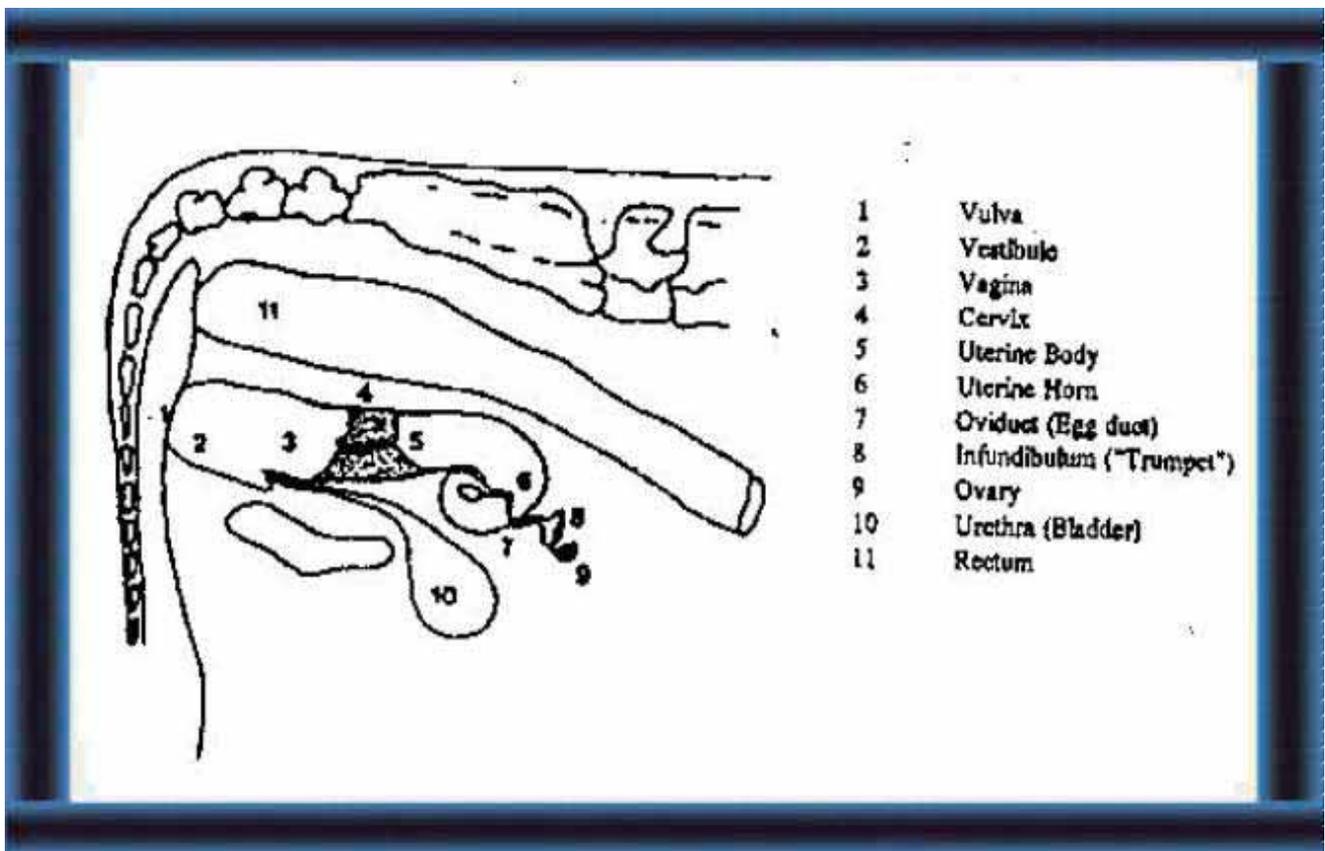


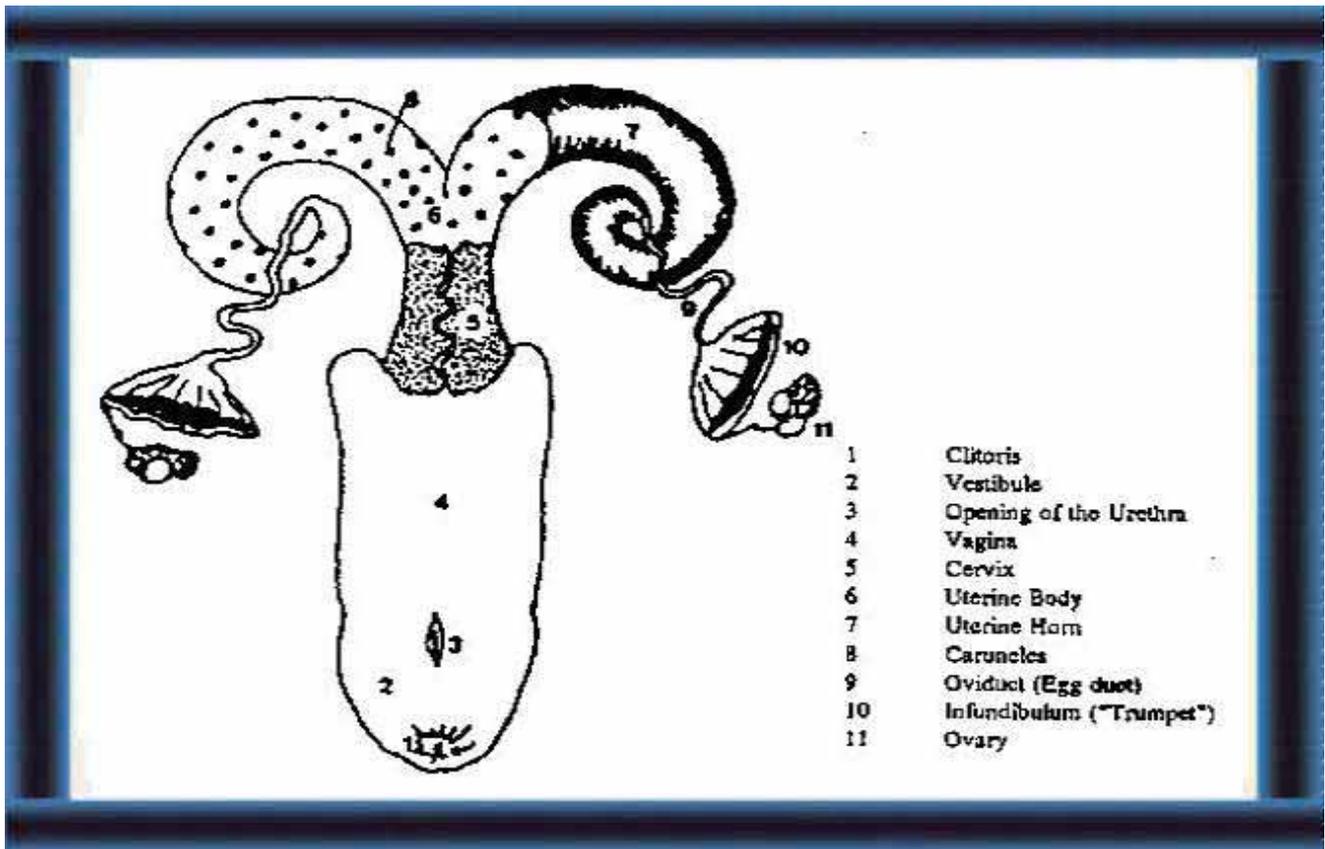
The inseminator transfers the straws as quickly as possible to a small liquid nitrogen container which he takes to the field. He uses long tweezers to reduce the time of transfer outside the nitrogen tank further.

page 26

## The female reproductive organs of dairy buffalo and cattle

The illustrations below show the anatomy of the female reproductive organs of dairy buffalo and cattle.



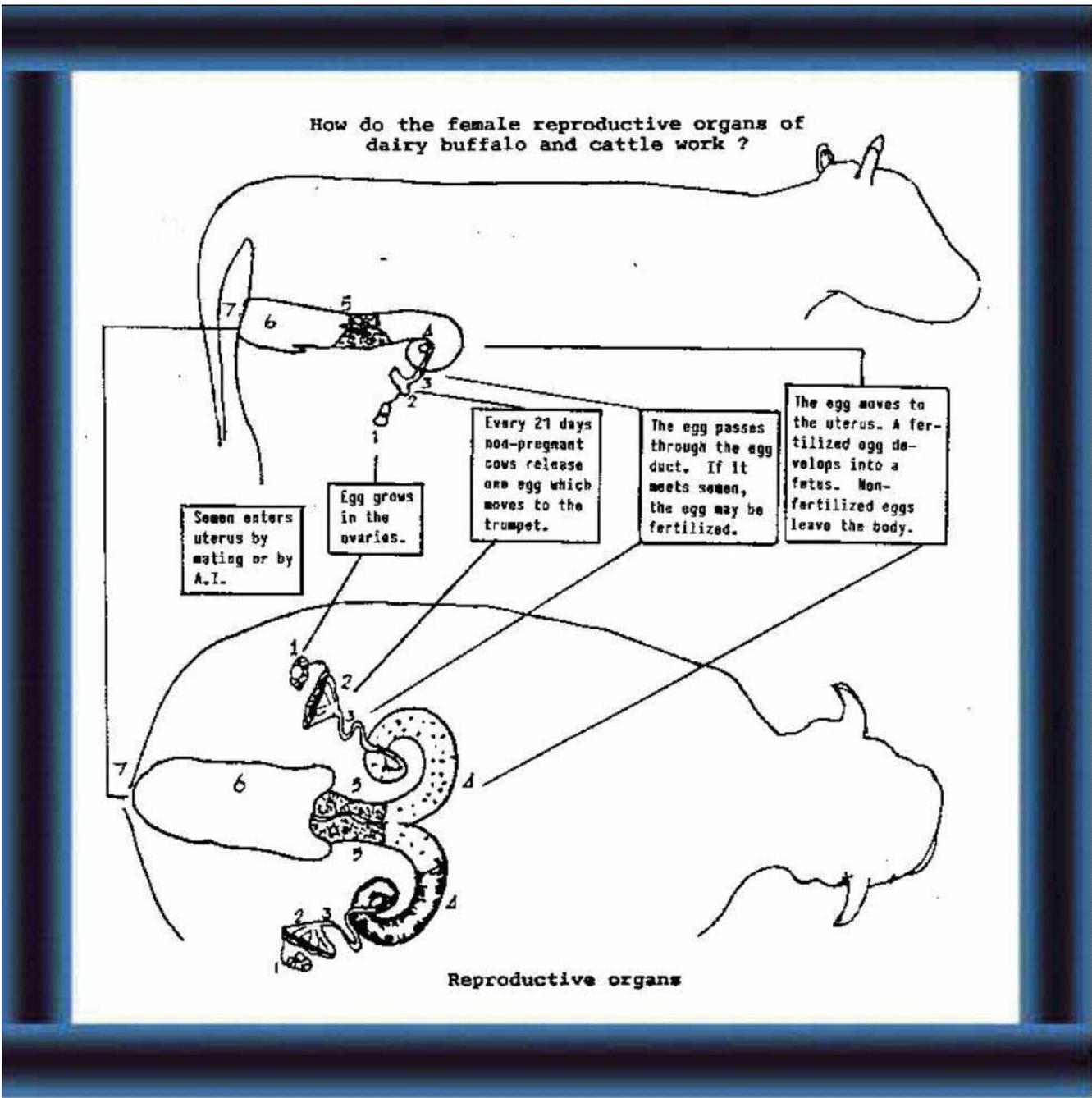


Hormones from the brain, the ovaries and uterus control the growth and release of eggs from the ovaries.

After release, the infundibulum or "trumpet" catches the egg and then it reaches the egg duct (oviduct). In mating or A.I., fertilization with a sperm cell takes place here. The fertilized egg moves to the uterus horn where it attaches to the wall and develops into a fetus.

Correct A.I. technique deposits the semen in the uterine body, not in one of the horns.

## How do the female reproductive organs of dairy buffalo and cattle work?



Reproductive

**organs:**

1. **Ovary** produces eggs
2. **Trumpet of egg duct** catches the egg from the ovary
3. **Egg duct** between trumpet and uterus, transports the egg
4. **Uterus** hollow organ with horns, carries fetus in pregnancy
5. **Neck of uterus** connects with vagina
6. **Vagina** passage for semen, urine and birth
7. **Vulva** outer opening of reproductive system.

## The insemination procedure

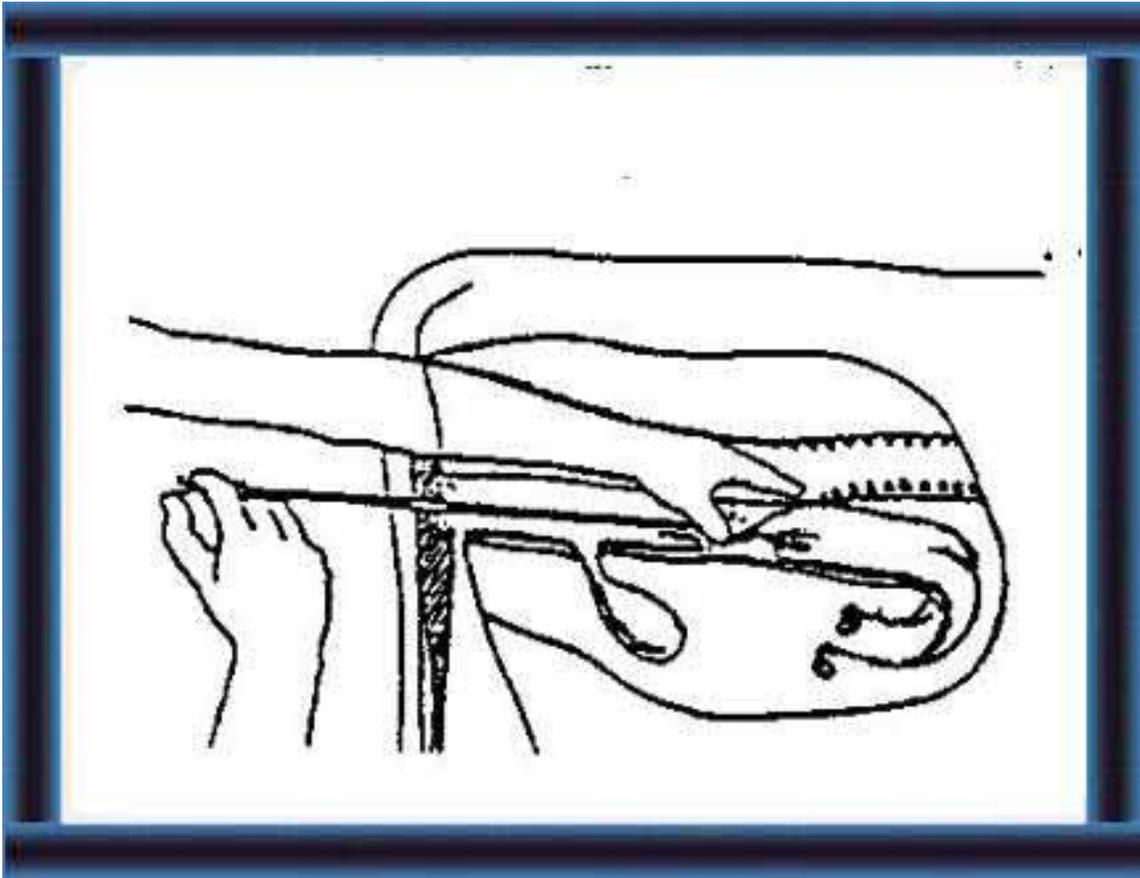
Introduce the breeding gun (insemination rod) into the vagina. The plastic sheet over the breeding gun is sterile. Keep it as clean as possible during the insemination procedure.

One way to do this is as follows: introduce the left arm into the rectum and exert a moderate pressure downwards to open the vulva. When the mucosa becomes visible, introduce the breeding gun without touching the skin. (52-53)

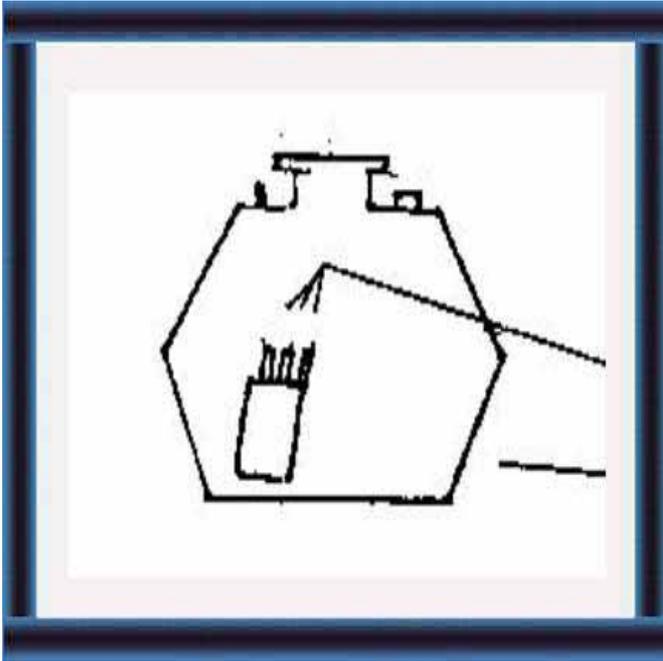
Introduce the breeding gun further along the upper wall of the vagina to avoid introduction into the blind sacculle in front of the urethra or into the urinary bladder.

At this stage, check for possible non-heat, abnormal conditions or pregnancy by rectal palpation with the left hand.

If insemination is continued, press the vaginal part of the cervix forwards with forefinger, thumb and middle finger. Introduce the breeding gun to contact the fingers at the same time.

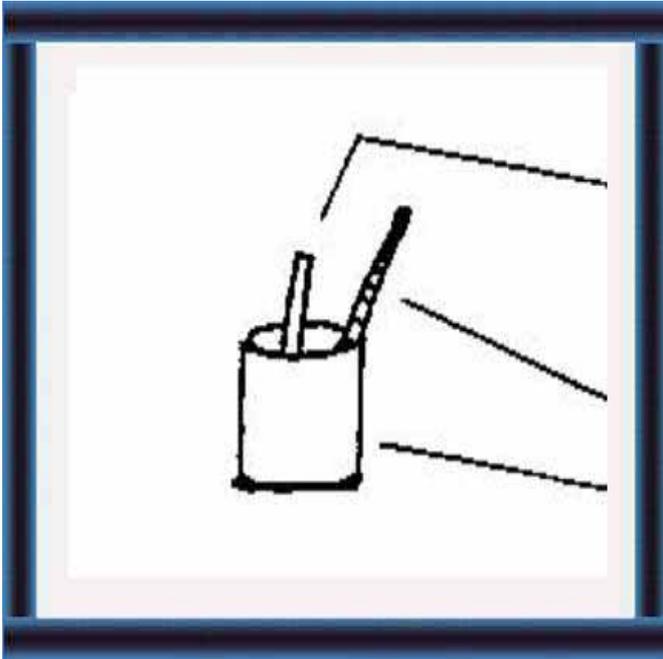


**Breeding gun in position in front of the cervix**



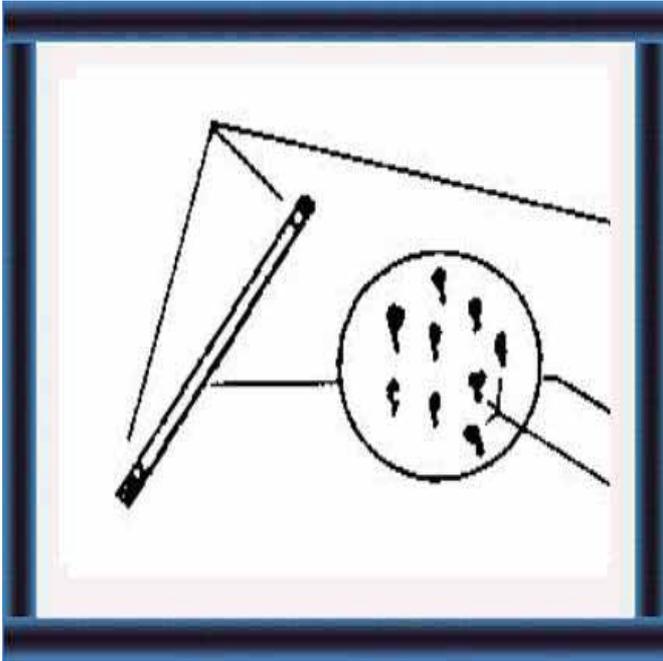
**Preparing the semen**

44 The A.I. technician **freezes** the semen and keeps it in **straws** in the special container.

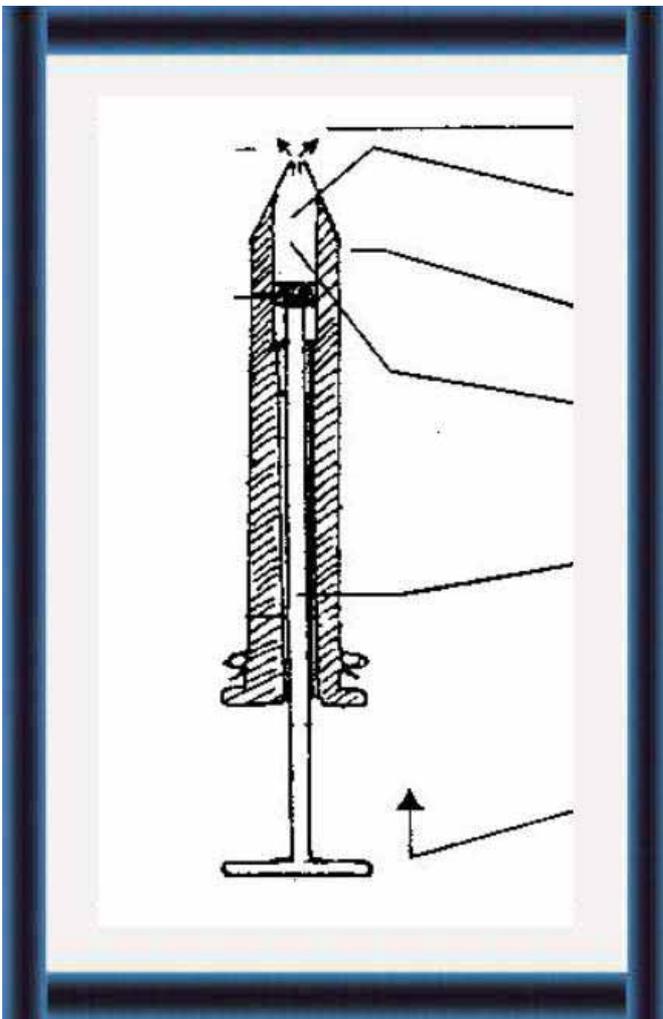


45 He removes a **straw** and **thaws** it in water immediately before use.

46 The straw is **sealed** at both ends.



One straw contains 20 - 30 million sperms.



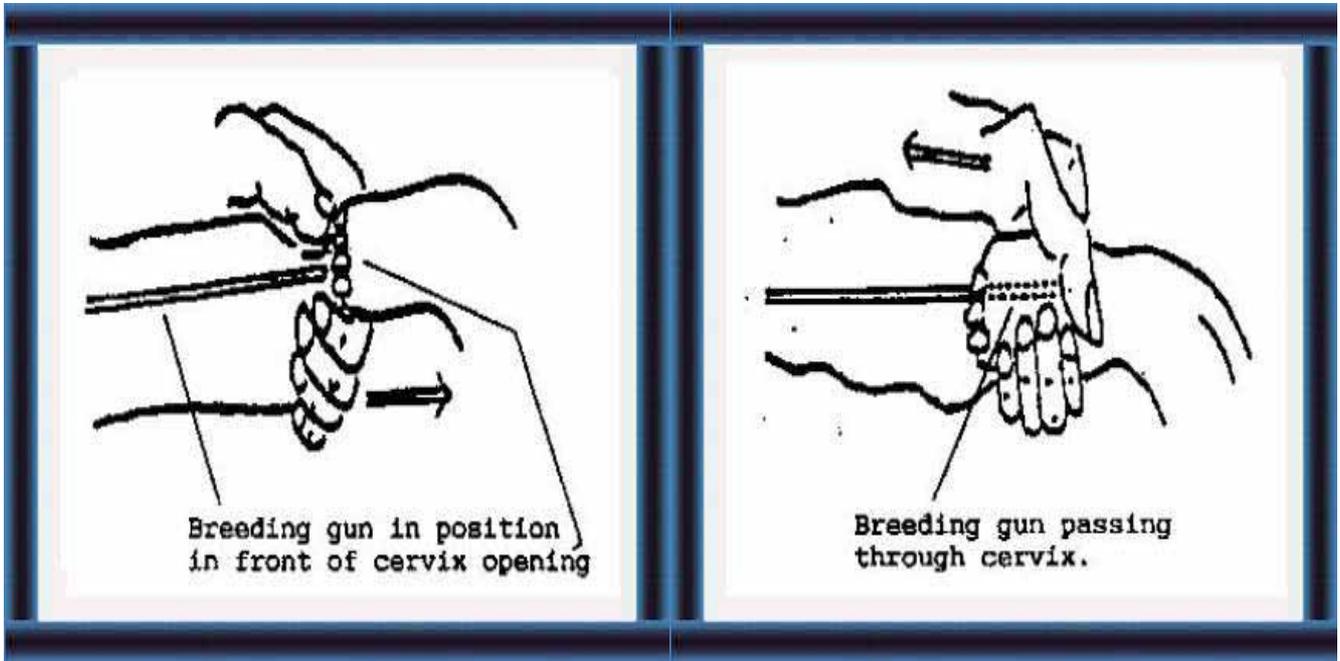
47 He places the  
straw inside the breeding gun.

semen inside the straw  
piston

The semen comes out  
when he pushes the piston.

## Breeding gun in position in front of cervix

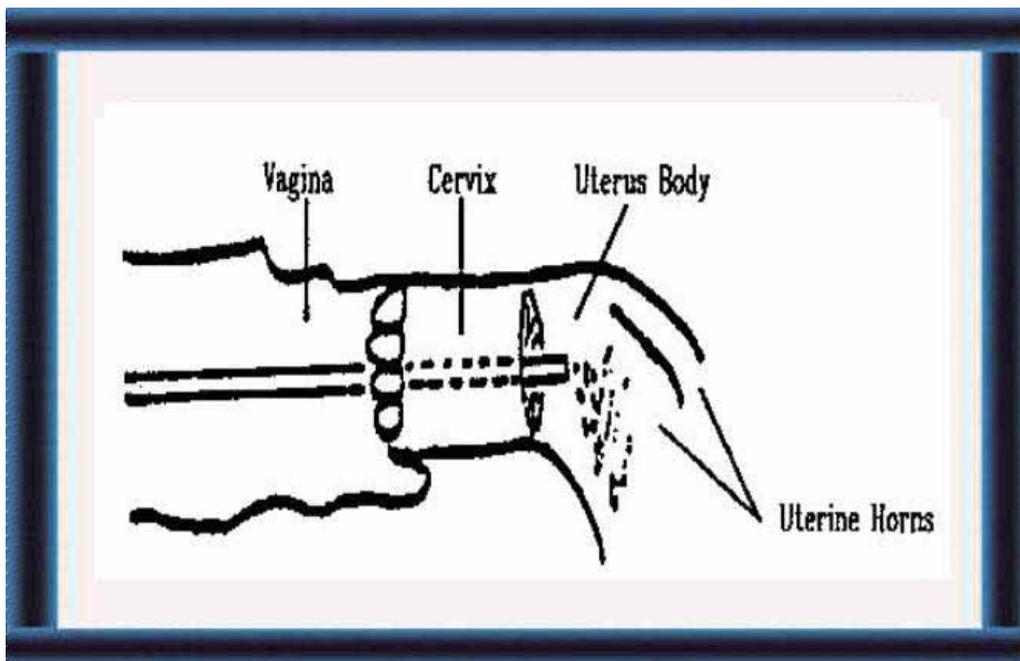
5. When the tip of the breeding gun is in position outside the cervix opening, gently try to push the breeding gun through the cervix, without using force.



**Breeding gun in position in front of cervix opening**

**Breeding gun passing through cervix**

6. With the tip of the forefinger you can feel when the tip of the breeding gun passes through the cervix into the uterus body. This is the correct place of deposit.



Correct deposit of semen before the breeding gun reaches one of the horns

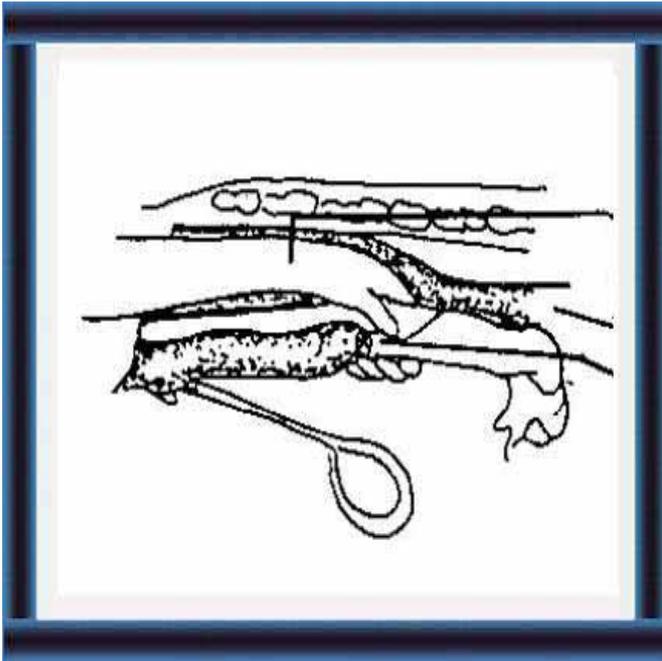
**Important things to remember:**

- 1. Always work as cleanly as possible. If you introduce any dirt into the uterus, it may cause infection, especially if the cow is not in heat.**
- 2. Always check the cow for abnormal conditions such as abnormal discharge, different size of the two uterine horns, possible pregnancy or missing heat. If in doubt about insemination, wait and check later or ask a veterinarian to check.**
- 3. Follow a sensible routine when you inseminate. This makes the work quicker and ensures that you always use a hygienic procedure.**

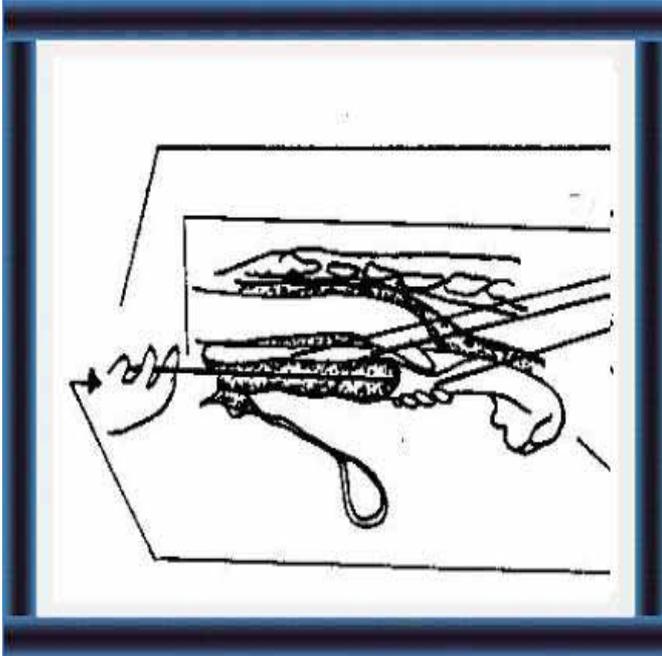
### Inseminating your cow



48 The farmer should stand **beside** the cow. This keeps the cow **calm**. The A.I. technician stands behind.



49 The A.I. technician puts **one arm** into the **gut** (rectum) of the cow. He fixes the **neck of the uterus** through the wall of the gut.



50 **The other arm** introduces the **breeding gun** through the **vulva, vagina** and the **neck of the uterus**.

When the breeding gun is in the **right** place, the A.I. technician **pushes** the piston and the semen **enters** the uterus.

## Pregnancy diagnosis

Sometimes the farmer does not know that his cow is pregnant and asks for insemination of a pregnant animal. Some cows may also show signs of heat even though they are pregnant already.

At the examination before A.I., it is possible for the inseminator to diagnose a possible pregnancy from day 60 after conception. A number of conditions indicate pregnancy, the most significant are as follows:

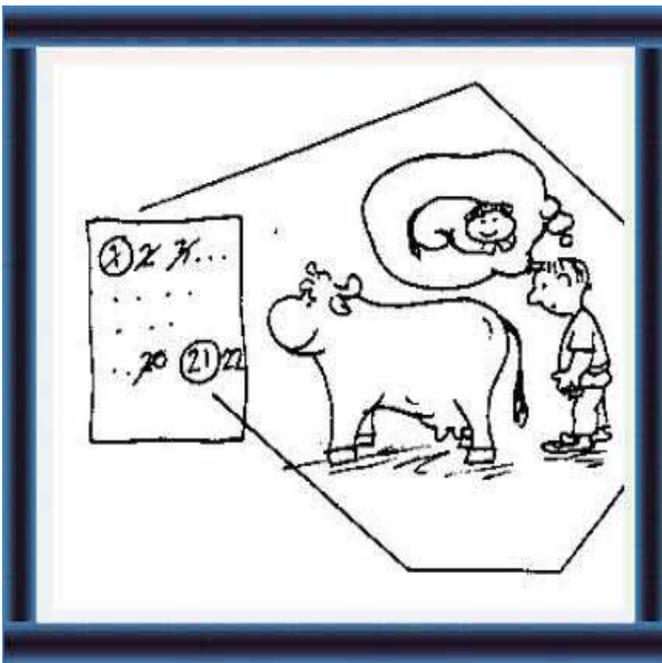
- Different size of the uterine horns. This may be due to pregnancy, but may also come from inflammation or previous calving.

- **Fluid content in one or both horns (may also be due to inflammation).**
- **Slip of fetal membranes when the inseminator lifts up the uterus wall.**
- **Palpation of placentomes, the size is about 1-2 cm diameter at 3 months pregnancy up to about 8 cm at 8 months pregnancy.**
- **From about 70 days after conception the inseminator can feel (part of) the fetus. Beware that the fetus may be out of reach at about 5-6 months pregnancy where it "drops" down on the abdominal wall.**
- **From about 90 days after conception, the inseminator can feel the increased size and pulsation of the middle uterine artery at the pelvic wall. The size of the artery is about 4-5 mm diameter in early pregnancy, becoming increasingly larger later in pregnancy.**

**If there is any doubt that the cow is pregnant, do not inseminate but wait and examine at a later stage.**

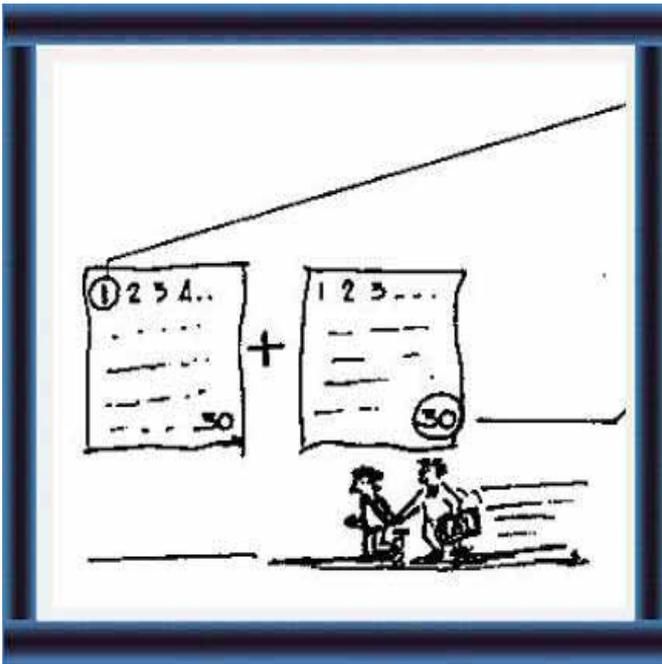
page 33

Did your cow become pregnant after A.I.?



51 After A.I. observe **carefully** for signs of heat.

No signs of heat **21 days** after A.I. means that your cow **may be pregnant**.



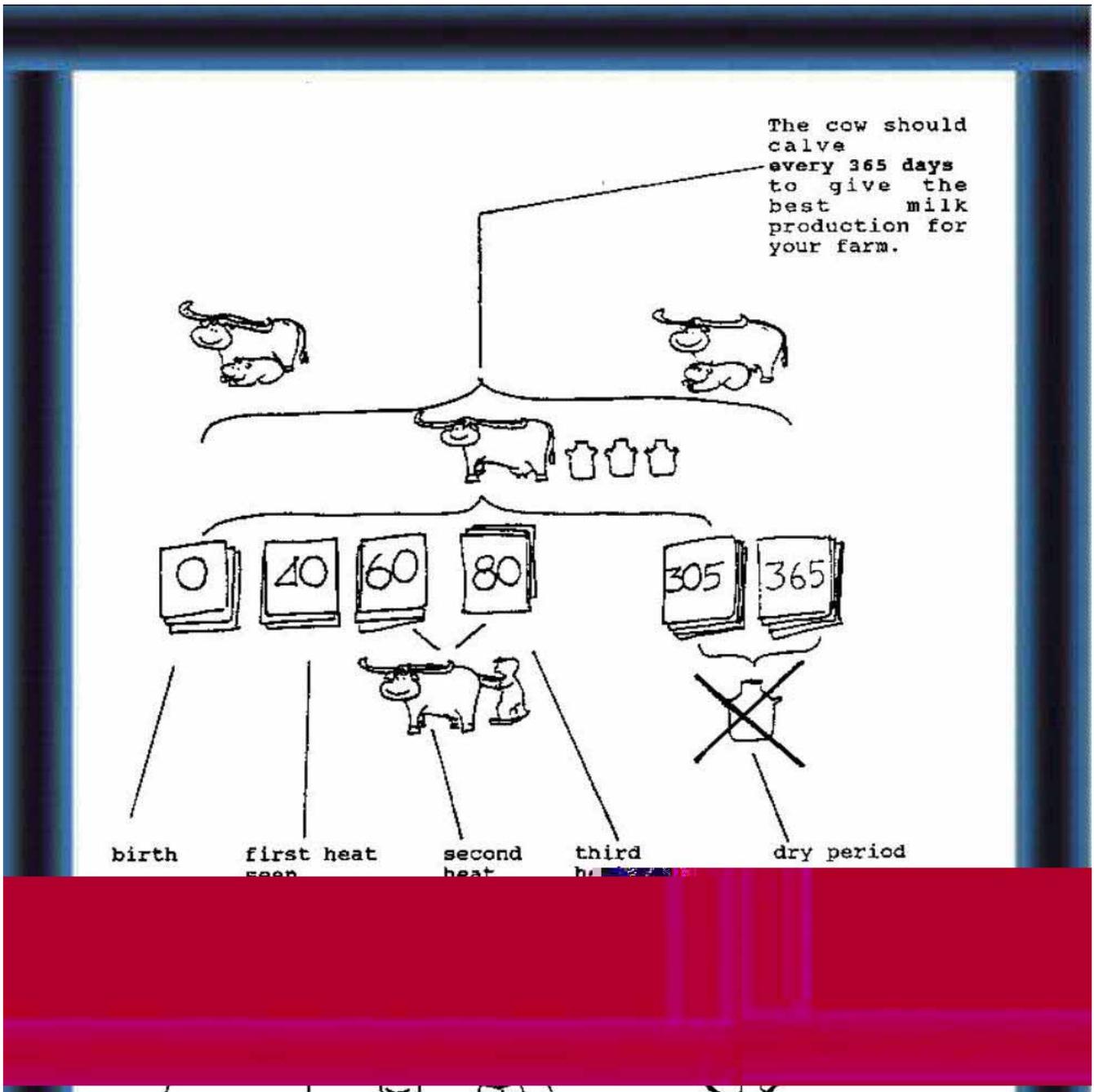
52 **60 days after A.I.**, if there are no signs of heat, call the A.I. technician or veterinarian to **check** for pregnancy.



53 If there are **signs of heat** and the cow is **not pregnant**, repeat A.I.

## How often should your cow calve? (Dairy cattle)

54 Your cow should calve **every 365 days** to give the **best milk production** for your farm.



**Birth First heat seen Second heat Third heat Dry period**

If your cow does not calve **every 365 days**:

- you will have **fewer calves**
- you will have **fewer dairy cows**
- you will have **less milk**.

## What to do about reproductive disorders

### Repeat breeding

Some cows fail to come on heat, show signs of heat irregularly or do not become pregnant after insemination (repeat breeders). The reasons for this may be many and can depend on the cow (abnormal body function) as well as the management (for instance: wrong feeding, failure of the farmer to observe heat). After 3 inseminations not resulting in pregnancy, ask the veterinarian to investigate causes of infertility.

### Infectious diseases

Abnormal vulva discharge, repeat breeding, abortion, retained placenta, dystocia and still born or abnormal calves may all be signs of infectious disease. Other animals can get these diseases. If any of the above signs are present, isolate the sick cow from the rest of the herd and call the veterinarian at once. Man can catch some reproductive diseases (for instance: Brucellosis) and become seriously ill.

### Metritis

Metritis is infection of the uterus and not uncommon after calving, especially with dystocia or retained placenta. Metritis may also be present after A.I. or mating. There is sometimes, but not always vaginal discharge. Other signs include reduced food intake, fever, general bad condition. The veterinarian can treat metritis and early treatment helps full recovery.

page 36

### Why doesn't your cow calve every year?



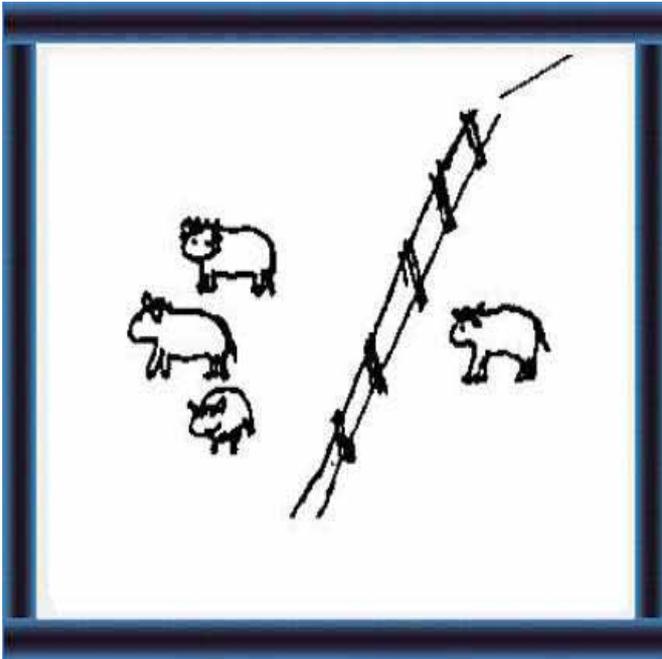
58 You may be doing something wrong.

**Check:**

- reproductive disorders
- feeding and management
- heat observation.



59 There may be something **wrong** with your animal. Inform the veterinarian if your cow is **not pregnant after 3 inseminations**.



60 **Separate** your animal from the others and inform the veterinarian **immediately** if your cow shows signs of **disease**:

- abnormal vulva or nasal discharge
- abortion
- retained placenta
- still born calves
- fever
- blood in urine
- ropy milk
- poor appetite.

## Heat signs in buffalo (61)

In India, it has been observed that the manifestation of heat in buffaloes is weak and the heat is of shorter duration during summer. This necessitates close observation for different signs of heat at shorter intervals. It has further been observed that teaser bulls had poor libido during summer. For efficient heat detection, therefore, protection against climatic stress should be provided.

It has been observed that few buffaloes exhibit signs of oestrus from 10 a.m. to 5 p.m. Most activity occurs near sun rise and sun set. Hence the breeding time is either missed during the night or breeding services at that hour are not available.

## Late sexual maturity (62-63)

**Puberty refers to the state of the animal when she is physically fit for reproduction as indicated by regular exhibition of the oestrus cycle.**

**Sexual maturity has immense economic importance for successful buffalo dairy farming. Economically, early first calving will ensure smaller investment and quicker return of the capital. Genetically, it reduces the generation interval, resulting in larger annual genetic gain from selection.**

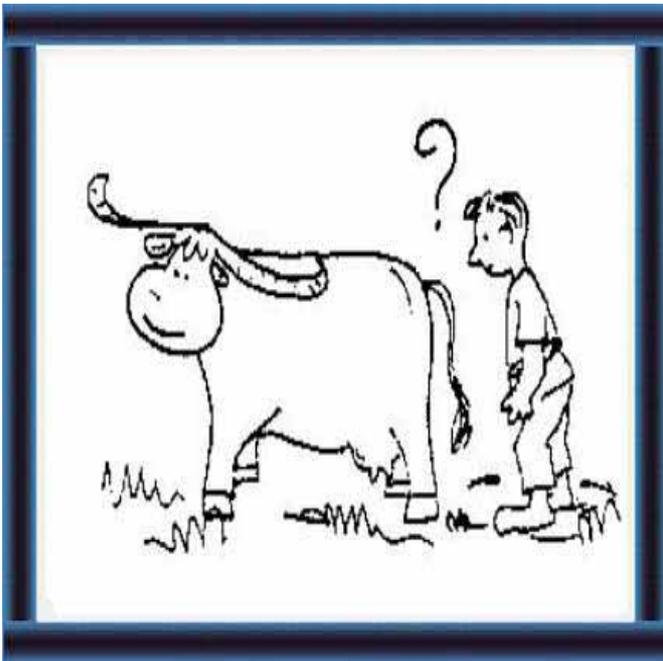
**The skeletal parts grow more rapidly after birth than other tissues. This rapid rate of skeletal growth decreases by about six months. Maximum muscular development occurs thereafter. The maximum growth rate is between 3 and 6 months and falls steeply after one year of age.**

**The young females when one year old are generally kept together with elder heifers and as such fail to get their share of nutrients. The problem appears to be one of management. On average, the age at first heat has been reported to be 30 months (range 26-62 months).**

**It has been indicated that the occurrence of first heat is more a function of weight than age. Most buffaloes generally start exhibiting heat symptoms on attaining about 340 kg body weight. Hence breeding, feeding and management practices should be directed towards attaining this weight as early as possible.**

**Buffaloes heifers fed normal rations but under intensive management alone could calve at 36 months of age.**

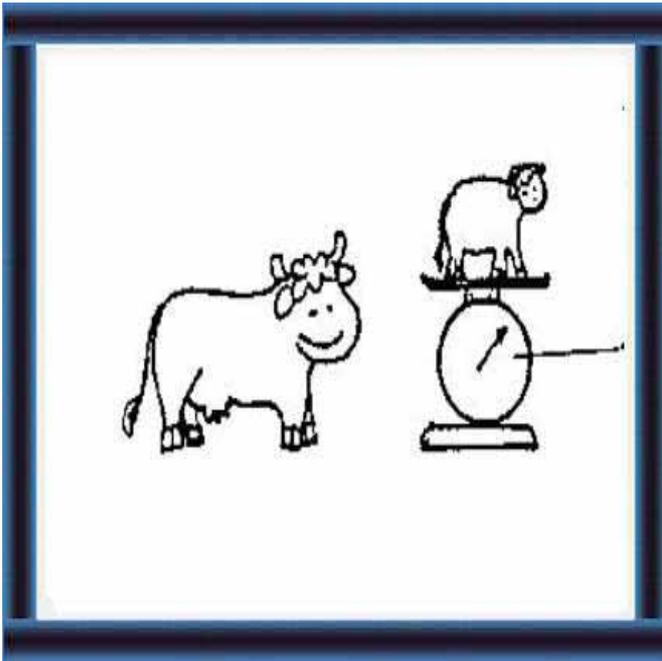
What are the main differences between dairy cattle and buffalo?



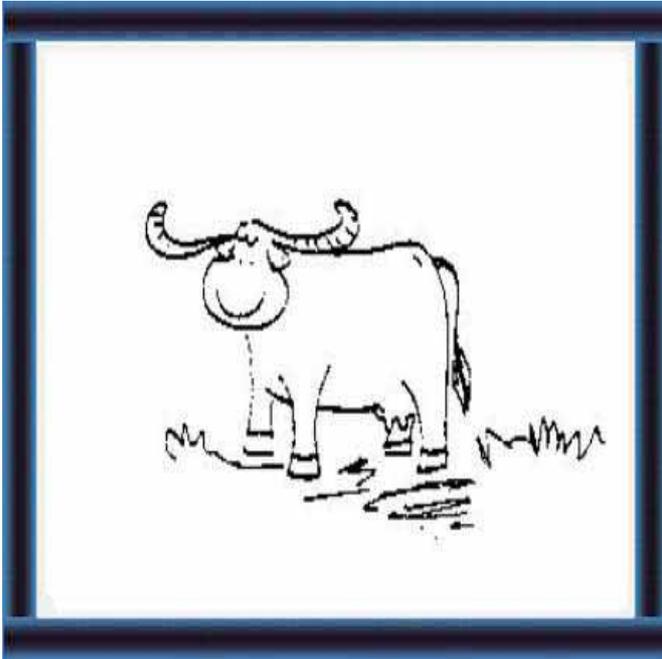
58 In buffalo, signs of heat:

- are often weak
- are often short, especially during summer
- often occur at night.

You must observe carefully.



59 The **first heat** in buffalo depends more on **weight** than on age and usually occurs about **340 kg body weight**.



60 You should breed, feed and manage your buffaloes so they get to this weight **as soon as possible**.

## **What are the main differences between dairy buffalo and cattle?**

### **Breeding behaviour (64-66)**

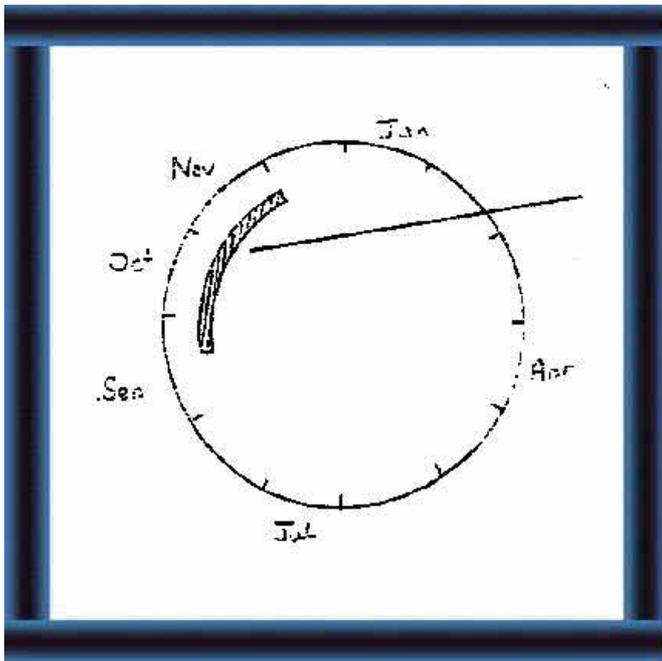
Dairy farmers suffer economic losses due to low reproductive efficiency in seasons of high environmental temperature. Seasonality of calving in buffaloes has been much debated in the past. However, it is now quite well known that buffaloes breed and calve throughout the year but certain months and seasons are more favourable for breeding than others. Data regarding frequency distribution of oestruses and calving in Pakistan buffalo show that about 63 percent of the buffaloes came in oestrus during autumn (September to November) and winter (November to February). The distribution of

calvings indicate that although the buffaloes calved throughout the year, the maximum calvings (39%) occurred during the humid - hot (July to September) season followed by 26% calvings during autumn (September to November). Spring calvers are very infrequent.

From the analysis of data on Nili-Ravi buffaloes in Pakistan under farming conditions, it was revealed that when teaser bulls were allowed access to buffaloes throughout the year, the frequency of calvings improved. The sexual activity of the males, during May and June was minimum, the temperature was highest and buffalo often failed to come on heat. The animals started coming on heat from July to September (humid - hot season) and reached a peak during autumn when the day length was decreasing.

In another study it was observed that of all calvings, 60 percent occurred from July to October. It was concluded that calvings in this period were followed by 40 days earlier return to oestrus, 48 fewer days open (service period) and 47 days shorter calving interval than for calvings in other months.

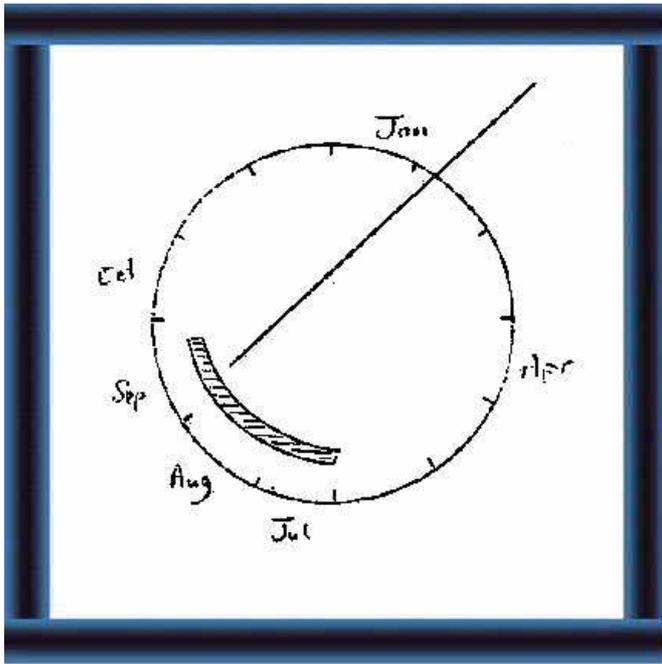
### Breeding behaviour



61 Buffaloes are very **seasonal** animals.

Mid September to end November is the active breeding period.

This is the **best time for breeding**.

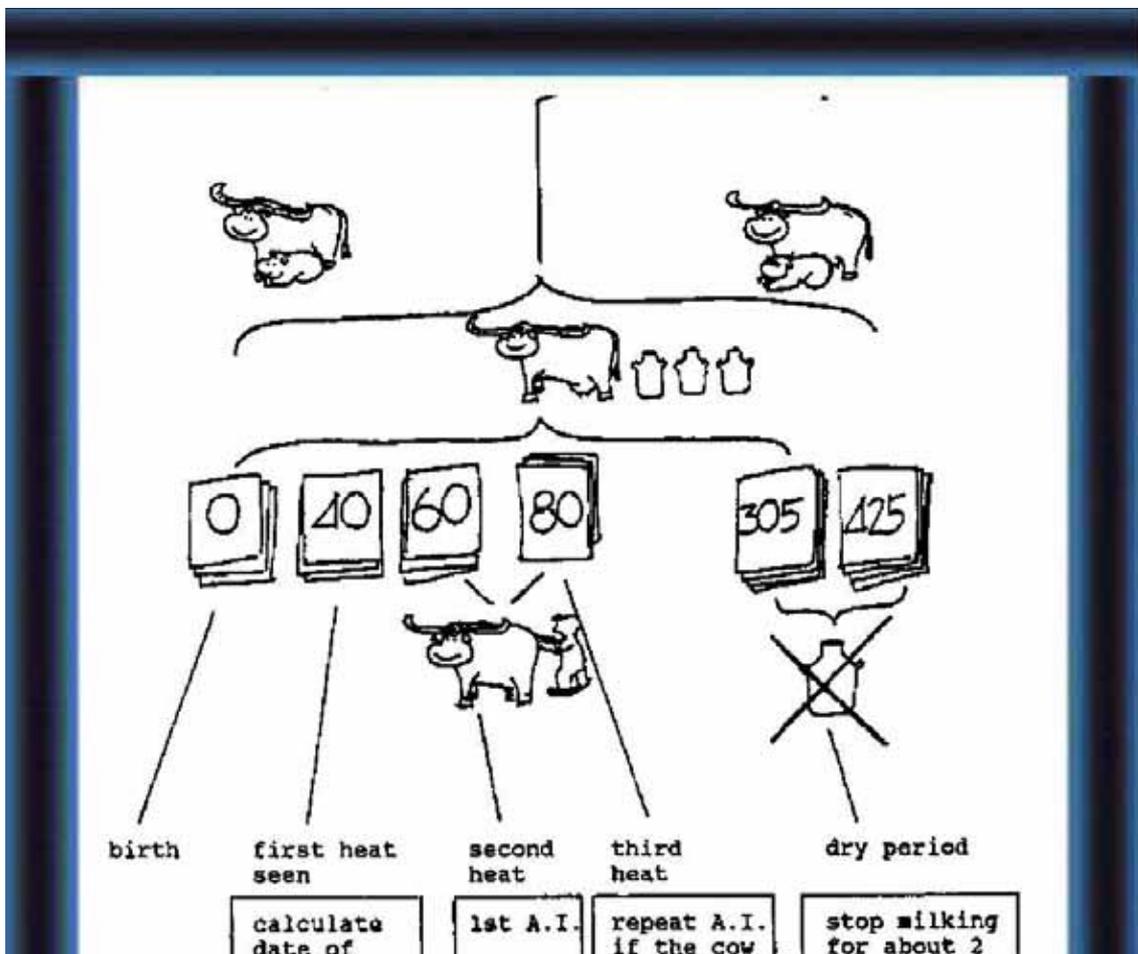


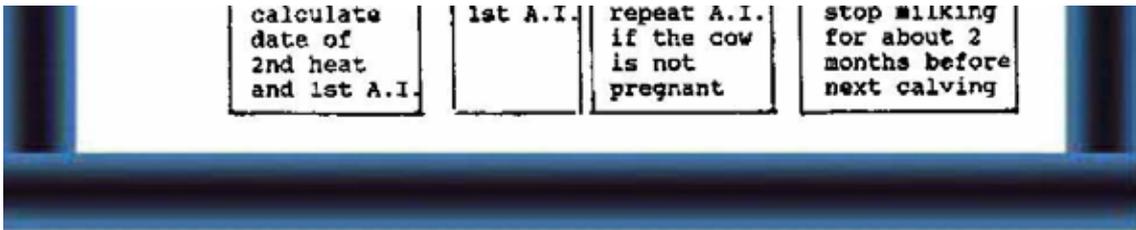
62 This shows the active calving period.

The **highest** number of calvings is the period from **July to September**.

## How often should your cow calve? (Dairy buffalo)

63 Your cow should calve **every 425 days** to give the **best milk production** for your farm.





**Birth    First heat seen    Second heat    Third heat    Dry period**

If your cow does not calve every **425 days**:

**You should begin breeding at 45-60 days after calving to make the calving interval as short as possible.**

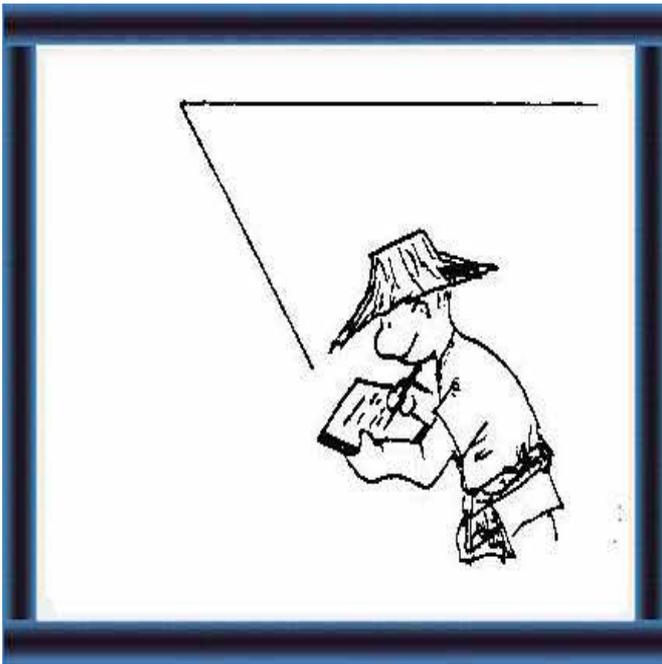
page 43

### Why keep records?

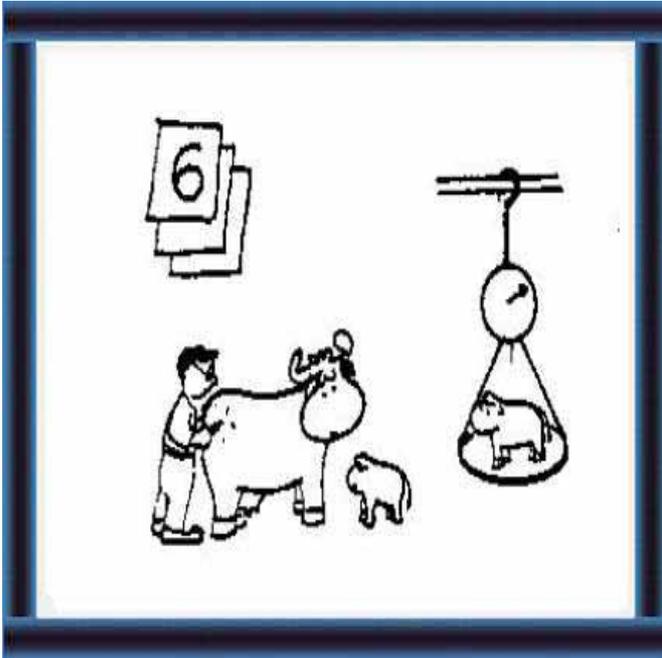


65 To keep your cow **healthy** and **calving every year** you need to **record information** to answer the questions of the A.I. technician and veterinarian.

66 **Keep records** on a special card for each cow.



Write down important things about your cow. Then it is easy to remember.



67 Keep records about:  
- dates  
- what happened: calving, vaccination, A.I., health etc  
- the exact figures  
- anything special.  
Discuss the cow card with your A.I. technician or veterinarian.

page 44

68

### **COW CARD: BREEDING AND CALVING**

**ANIMAL:** Ear tag no: \_\_\_\_\_ Breed: \_\_\_\_\_ Birth date: \_\_\_\_\_  
**OWNER:** Farm no: \_\_\_\_\_ Name: \_\_\_\_\_ Address: \_\_\_\_\_  
**INSEMINATIONS (A.I.) / NATURAL BREEDING**

Year 1st Insemination (A.I.) Heat A.I. No Bull Date Date	Year 2nd Insemination (A.I.) Heat A.I. No Bull Date Date	Year 3rd Insemination (A.I.) Heat A.I. No Bull Date Date	Pregnancy Diagnosis Date	Remarks

**CALVINGS**

Year	Calving No	Calving Date	Sex	Calf Father	Birth Weight	Aid required at calving	Retained placenta Yes/no	Abnormal vaginal discharge	Remarks

**TO BE KEPT IN THE BARN**

**What do you know about A.I.?**

**A.I. and reasons for using it**

- 1 Differences between A.I. and natural mating** (5-8)
- 2 Reasons for using A.I.**
  - no direct contact between bull and cow (9)
  - can use semen from good bulls in other places (10-13)
  - A.I. may be cheaper than a herd bull (14-15)

<b>- A.I. suitable for dairy cattle, swamp and river buffalo</b>	<b>(16-17)</b>
<b>Things to remember in A.I.</b>	
<b>1 Be ready to observe heat signs, day or night</b>	<b>(18)</b>
<b>2 Call A.I. technician when heat signs observed</b>	<b>(19)</b>
<b>3 Use only well-trained A.I. technician</b>	<b>(20)</b>
<b>Heat signs</b>	
<b>1 Restlessness and separation</b>	<b>(21)</b>
<b>2 Bellowing</b>	<b>(22-23)</b>
<b>3 Lower food intake and milk production</b>	<b>(24)</b>
<b>4 Sniffing and mounting other cows and being mounted</b>	<b>(25-26)</b>
<b>5 Discharge from vulva</b>	<b>(27)</b>
<b>6 Heat signs in buffalo</b>	<b>(28-29)</b>
<b>7 Important points in observing heat</b>	<b>(30-33)</b>
<b>When to inseminate</b>	
<b>Within 6 hours of the end of the heat period</b>	<b>(34-38)</b>
<b>Quality of semen</b>	
<b>1 Semen is carefully selected to be:</b>	<b>(39-41)</b>
<b>- clean</b>	
<b>- free of germs</b>	
<b>- free of disease</b>	
<b>2 Semen kept in good condition by freezing at -196° C</b>	<b>(42)</b>
<b>The function of the reproductive organs</b>	
<b>Names of 7 major reproductive organs and their functions</b>	<b>(43)</b>
<b>Insemination</b>	
<b>1 Preparing semen:</b>	
<b>- collecting</b>	<b>(39)</b>
<b>- testing</b>	<b>(41)</b>
<b>- freezing and storage</b>	<b>(42,44)</b>
<b>- thawing</b>	<b>(45-46)</b>
<b>- placing in breeding gun</b>	<b>(47)</b>
<b>2 Inseminating the cow:</b>	
<b>- position and keeping cow calm</b>	<b>(48)</b>
<b>- introducing breeding gun</b>	<b>(49)</b>
<b>- depositing semen</b>	<b>(50)</b>
<b>3 Checking pregnancy after insemination:</b>	
<b>- no heat signs 21 days after A.I.</b>	
<b>- pregnancy possible</b>	<b>(51)</b>
<b>- no heat signs 60 days after A.I.</b>	
<b>- call vet. to check</b>	<b>(52)</b>

- heat signs and cow not pregnant:	
- repeat A.I.	(53)
Frequency of calving for dairy cattle	(54)
Reasons for cows not calving every year	
1 Poor management or heat observation	(58)
2 Problem with cow	
Isolate if signs of disease and inform vet	
Main differences between dairy cattle and buffalo	
1 Weak heat signs in buffalo	(58)
2 Importance of weight in buffalo	(59-60)
3 Breeding behaviour	(61-62)
Frequency of calving for dairy buffalo	(63)
Record keeping	
1 Reasons for record keeping	(65)
2 What to keep records about	(66)
3 Cow card for breeding and calving	(67)





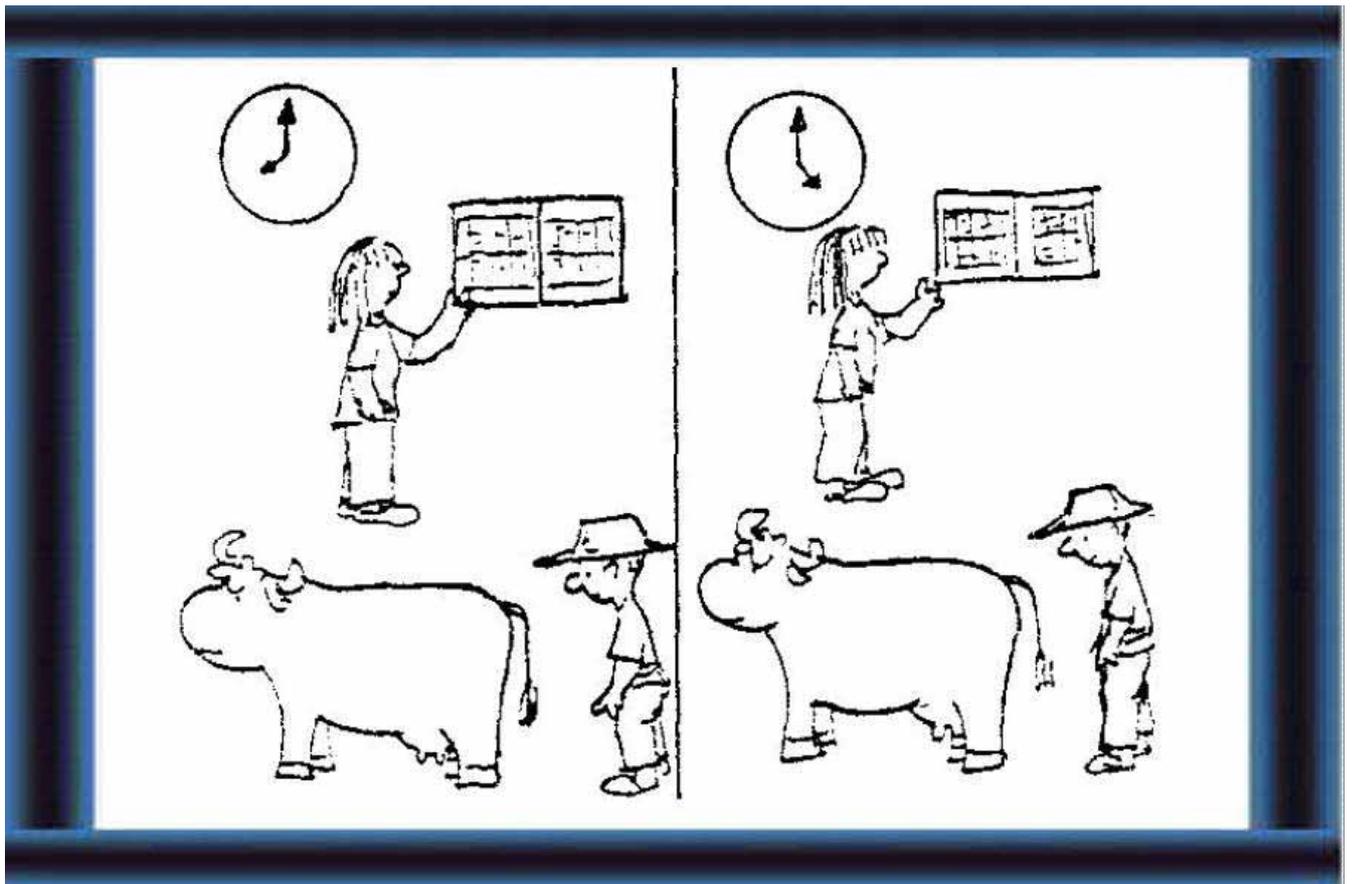
# Small-Scale Dairy Farming Manual

## Volume 4

### Husbandry Unit 6.2

# BREEDING CALENDARS

page 49



Extension Materials

## What should you know about breeding calendars?



### Why should you use a breeding calendar? (5-8)

1 A breeding calendar helps you to **improve breeding** in your herd. You can write down **important things** about your cows on the calendar.

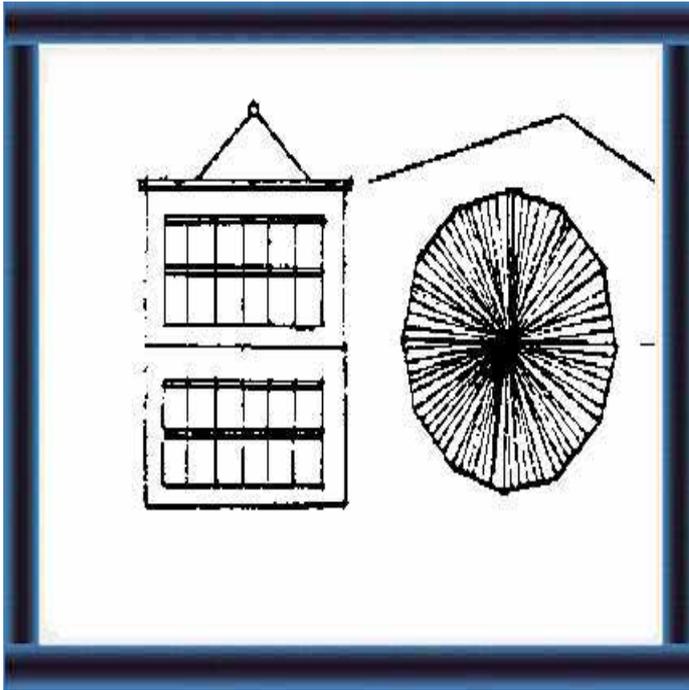


### How can you make sure your cow calves every year? (9)

2 **Check** your breeding calendar **every day** to help you **plan breeding**.

You know:

- when your cow calves
- when your cow shows heat
- when your cow is bred
- when to dry off your cow.



**How can you make your own breeding calendar?**

- Breeding calendar 1 (11-19)
- Breeding calendar 2 (29-41)
- 3 You can easily learn to make two kinds of breeding calendar.



**How can you use your breeding calendars?**

- Breeding calendar 1 (20-28)
- Breeding calendar 2 (42-49)
- 4 You can easily learn to use them to produce more calves

## **BREEDING CALENDARS**

### **Husbandry Unit 6.2:**

#### **Technical Notes**

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

**Why use breeding calendars? (5-10)**

**For every dairy farmer the most important part of his job is to make sure that**

**his cows calve as often as possible.**

**This requires efficient observation of heat, insemination (A.I.) at the right time, drying off prior to calving and attention at calving time.**

**Information written down in note books, on loose sheets of paper and likewise tends to be irregular and forgotten.**

**A simple breeding calendar, kept in the barn, makes it easy to write down every important event for each cow in the herd. At the same time, it can be consulted every day and inform the farmer if he should be aware of heat, drying off, approaching calving etc. for any of his cows.**

**Even in the small herd, efficient breeding is the main problem. A breeding calendar can often improve breeding efficiency on the farm considerably, because it helps the farmer to do the right thing at the right time.**

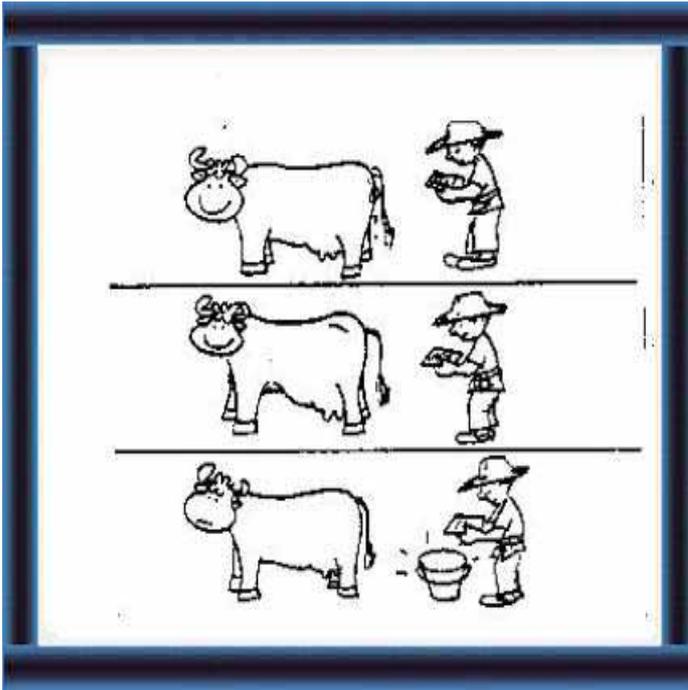
**It should be emphasised, however, that cows should be observed daily for signs of heat, both morning and afternoon, because there can be irregularities in the breeding cycles, and cows may not show clear signs of heat especially in the 1st heat after calving. The breeding calendar should be used as a guide for closer observation.**

page 52

### Why should you use a breeding calendar?



5 A calendar helps you to **keep records.**  
It is **easy to lose** note books and pieces of paper.



6 The calendar tells you **when to look for signs of:**

- heat
- calving

and **when to :**

- breed your cow
- dry her off.



7 It is:

- cheap to make
- easy to make
- easy to use.



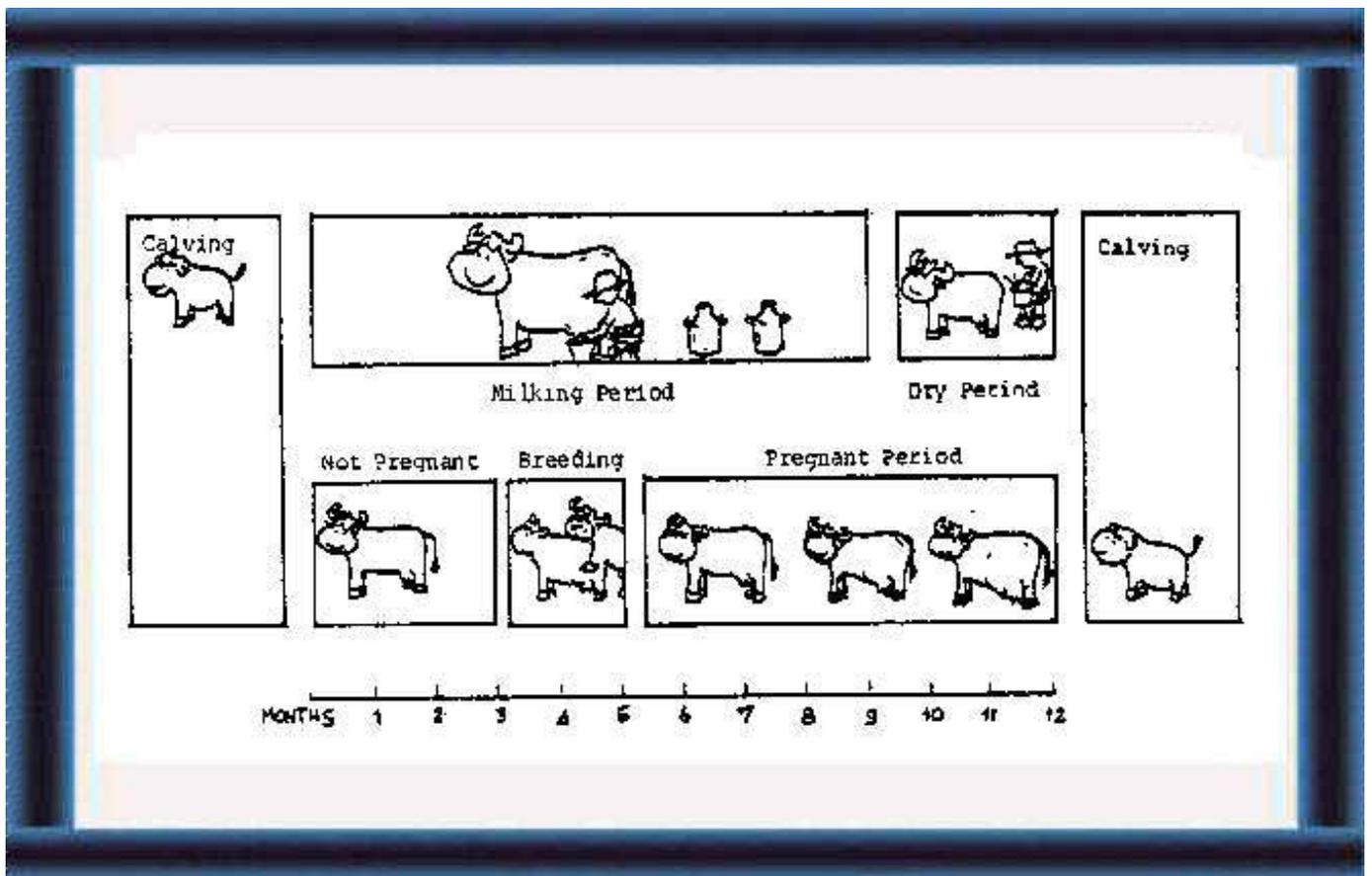
8 By doing the **right thing** at the **right time** you can **improve breeding**.  
**More calves mean more money.**

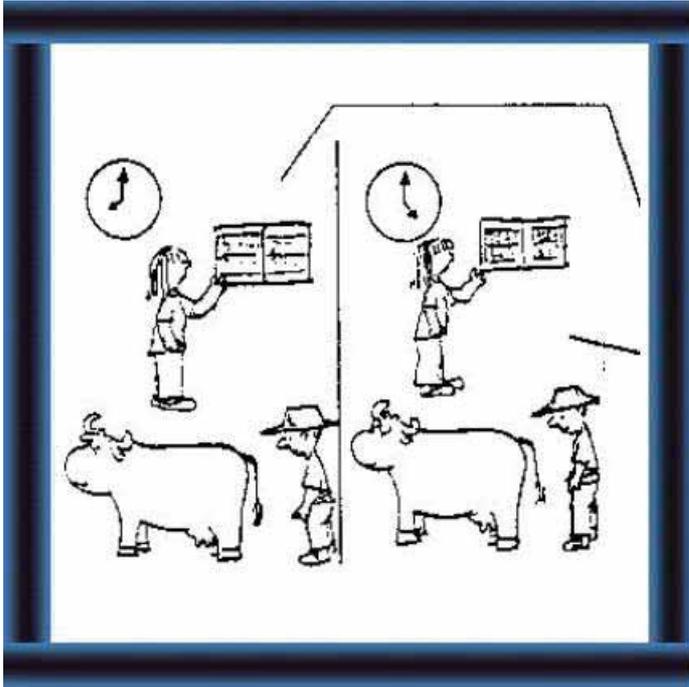
page 53

**How can you make sure your cow calves every year?**

You must understand the **connection between calving - milking - breeding - drying off.**

9 Study this farmer's cow over one year:





page 54

10 Your breeding calendar tells you **when** to do **what** so you can make sure your cow **calves every year**.

#### **Important**

Use your breeding calendar as a guide for **close heat observation**.

Observe heat **morning and afternoon** because:

- breeding cycles **may not be regular**
- heat signs **may not be clear** especially in the first heat.

## **Can I make my own breeding calendar?**

Given below are two examples of breeding calendars that can be produced by the farmer himself, both of which are comparatively cheap to make.

### **Breeding calendar 1**

This breeding calendar is intended for the small herd (less than 5 cows), but in principle it can be used in bigger herds also.

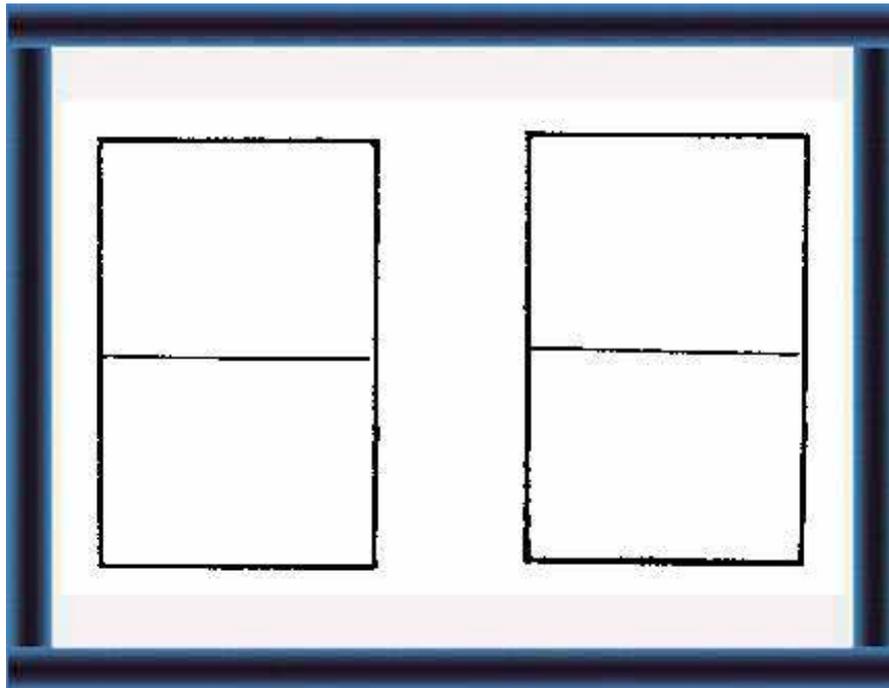
The breeding calendar is: - easy to make  
- easy to handle  
- cheap to manufacture.

#### **Principle**

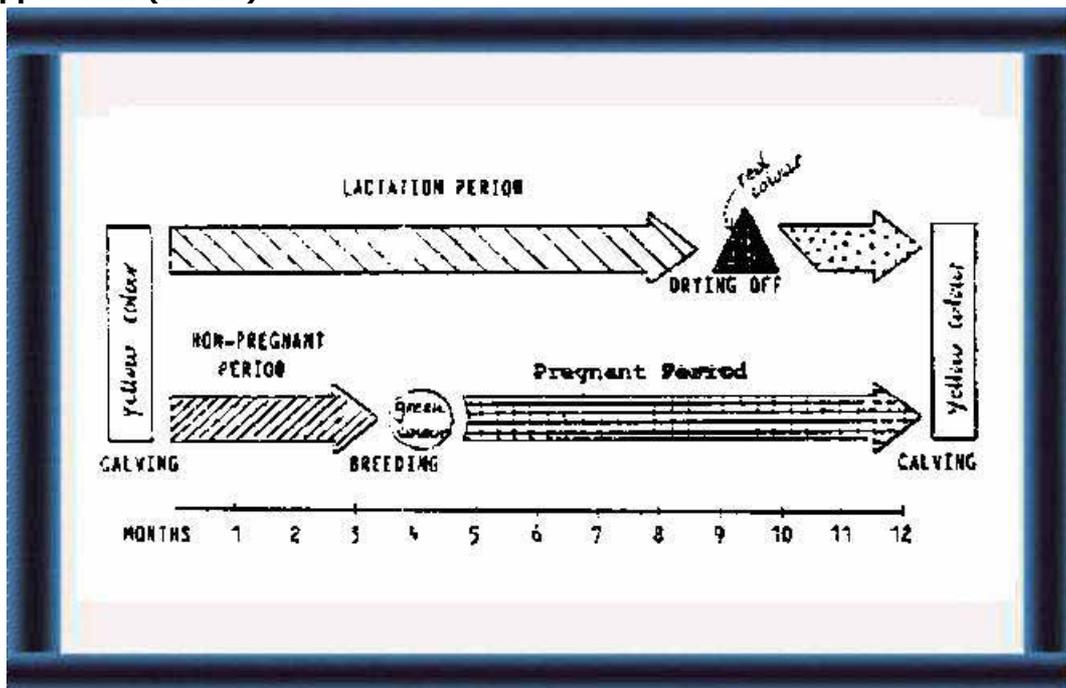
2 pieces of stiff, white card are required - recommended measurements: 80 cm x 110 cm (but bigger or smaller pieces can also be used). (11)

Divide both cards into two halves by drawing a line with a pencil. (12)

page 55



3. On one of the cards, construct the key opposite (with a ball liner) on the upper half. (12-13)

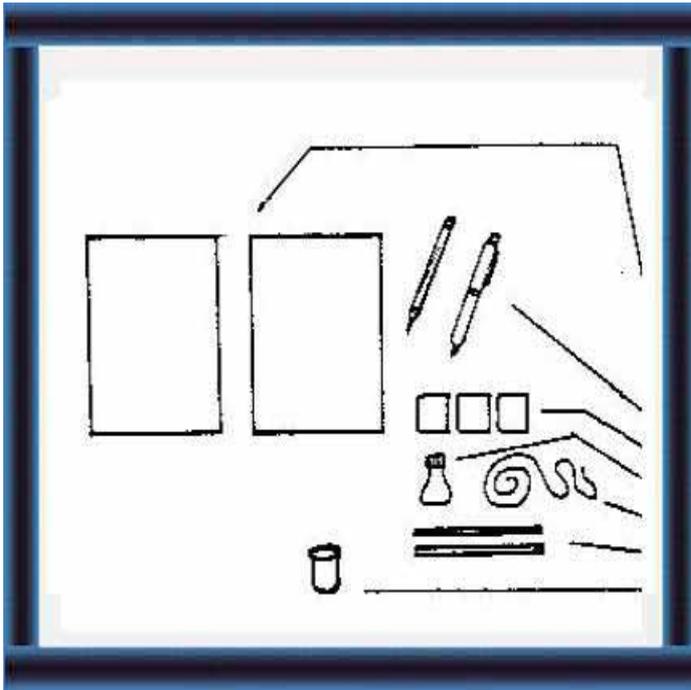


The key shows the relationship between:

Calving - lactation period - time of drying off - dry period

and

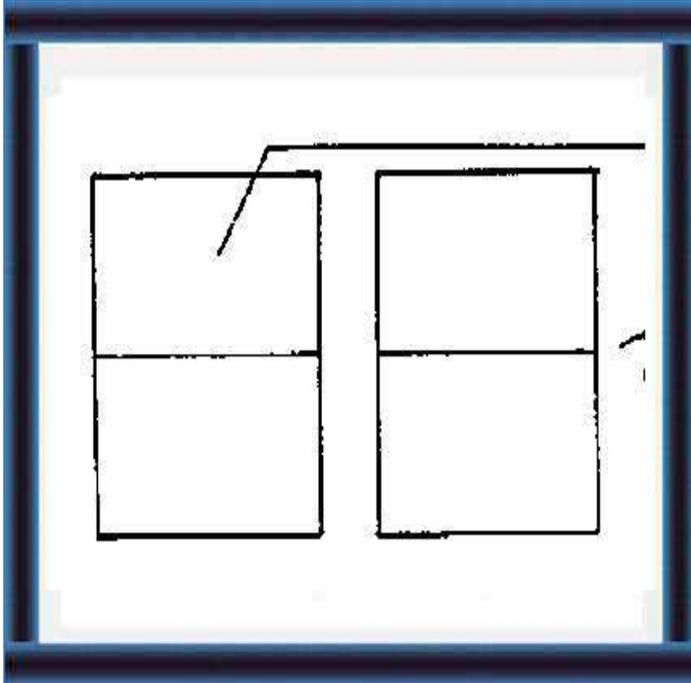
Calving - non-pregnant period - time of breeding - pregnancy period



### Breeding calendar 1

#### 11 You need:

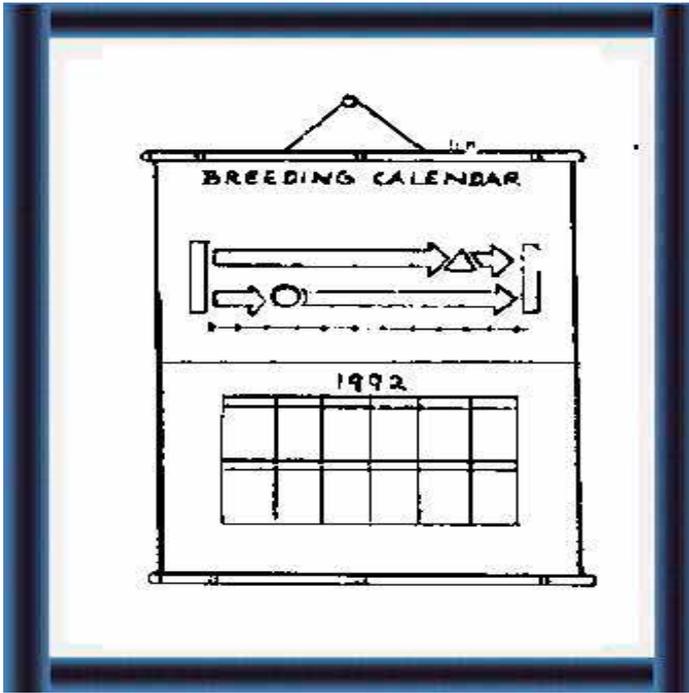
- 2 pieces of stiff white card about 80 X 100 cm.
- pen and pencil
- sticky, coloured paper
- glue and string
- sticks and small bag or container.



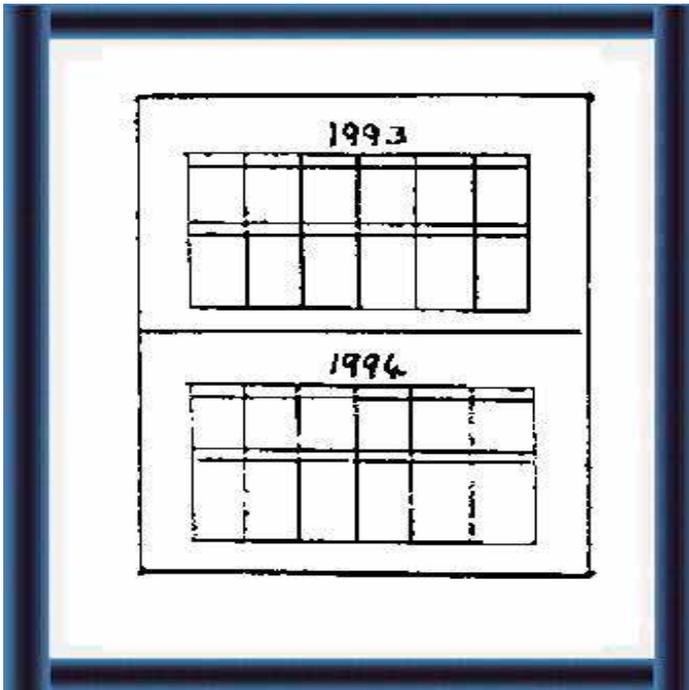
12 **Divide** both cards into **halves** by drawing lines.





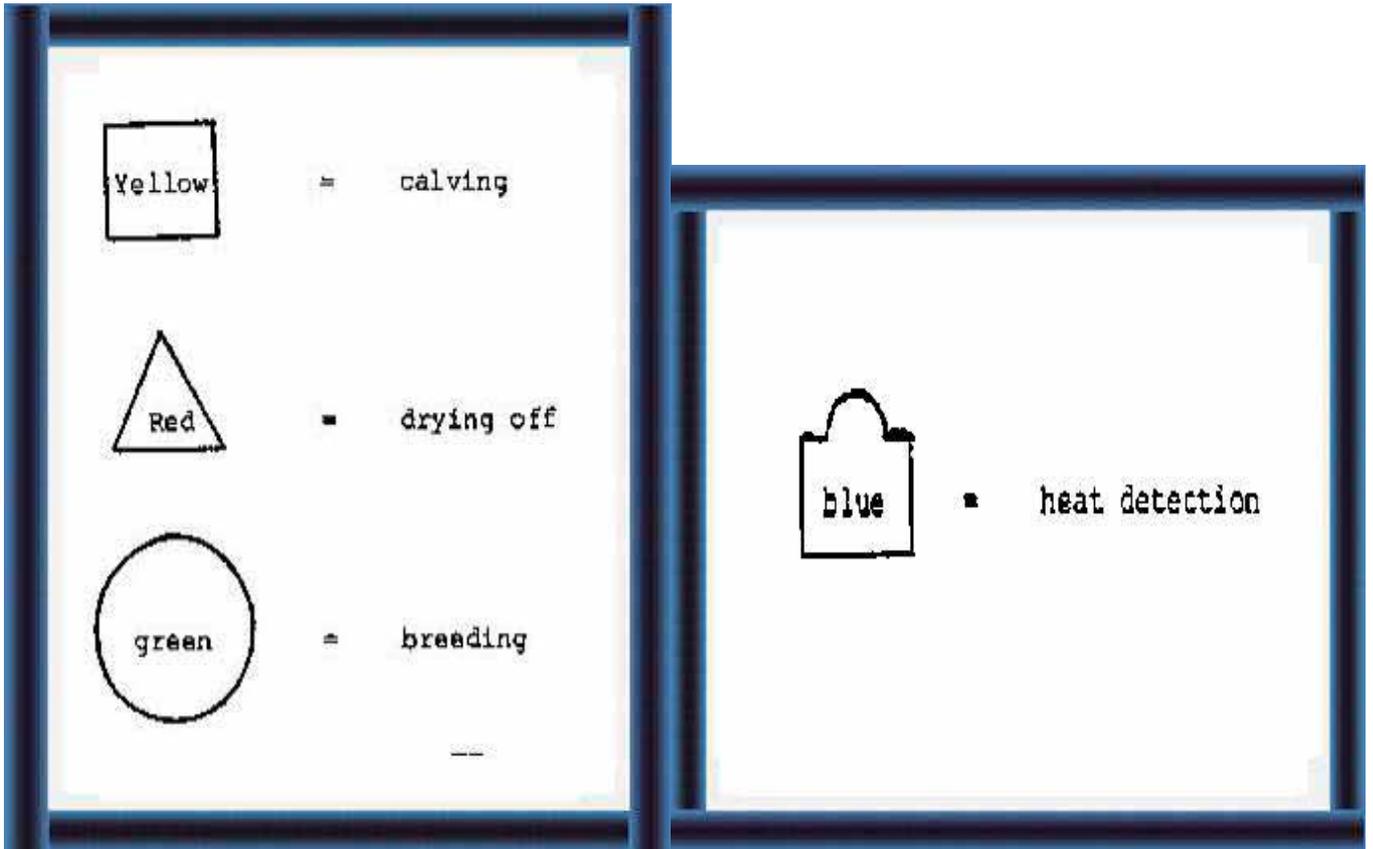


15 Your **complete card** should look like this.



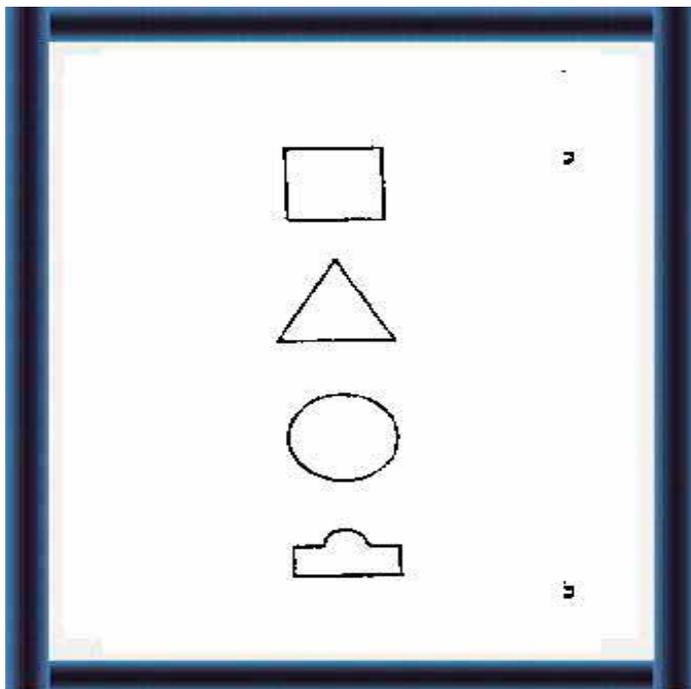
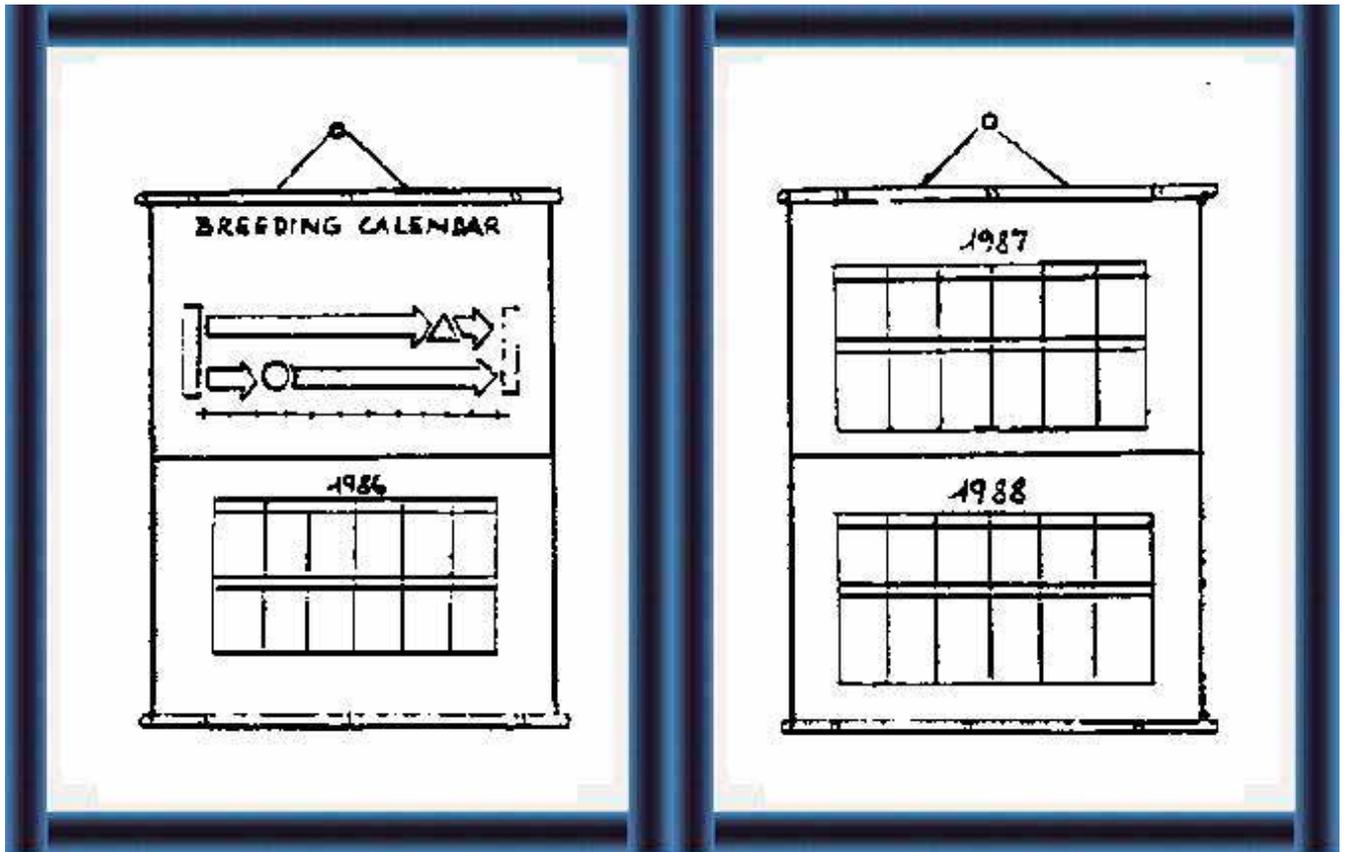
16 On the second card:  
- draw **next year's** calendar on the **top half**  
- draw **the year after next's** calendar on the **bottom half**.

**6. Using self-adhesive paper, produce a number of coloured paper sign (about 1 cm high) like this: (17)**

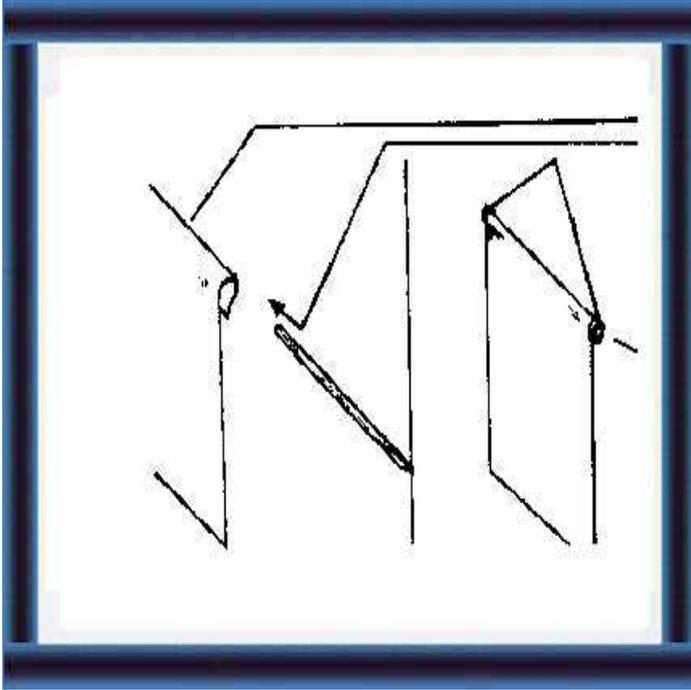


**These signs should be kept in a small bag or container close to the breeding calander.**

**7. Mount the cards with a stick (for instance bamboo - stick) at the top end and bottom end, and hang them beside each other on the wall in the barn. (18-19)**



17 Colours and shapes help to make your breeding calendar clear. Use the sticky, coloured paper to make signs about 1 cm high.  
? calving (yellow)  
<sup>a</sup> drying off (red)  
± breeding (green)  
- heat detection (blue).



18 **Fold over the top** of your calendar and **glue**.  
**Put a thin stick** through the **fold**.  
**Tie a piece of string** to **each end** of the stick.



19 **Hang up** your calendars next to each other in the barn.  
Keep the coloured signs in a **small bag** or container **near** your breeding calendar.

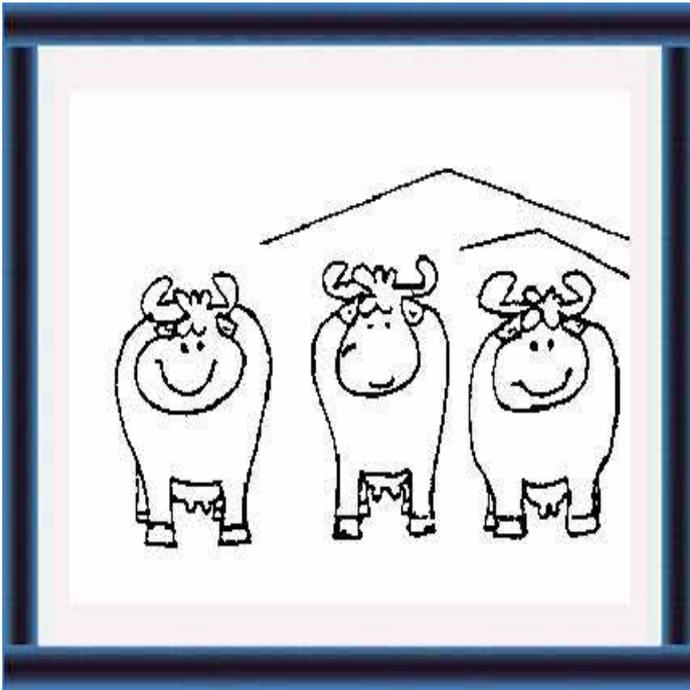
## How to use the breeding calendar?

When a cow has been bred (natural service or A.I.), the green breeding symbol marked with the number of the cow is placed at the day of breeding and the blue heat detection symbol marked with number of cow placed on the 21st day from the date of breeding. If the cow does not return to heat, the symbol is kept in this position. Should the cow return to heat and be bred again, the symbols are moved on to the new date. (20-24)

**Example:** Cow no. 4 was bred on the 20th October, 1986 and the following entries were made on the 1986 Calendar. If the cow does not show any signs of heat from about 10 November until it completes 45 days after breeding, i.e. till about 5 December, have it examined for pregnancy.

OCTOBER	
1	17
2	18
3	19
4	20 (4)
5	21
6	22
7	23
8	24
9	25
10	26
11	27
12	28
13	29
14	30
15	31
16	

(4)  
BREEDING SYMBOL, (green)  
COW NO. 4



20 Give **each** of your cows a **number** and **add** the numbers to your **breeding signs**.

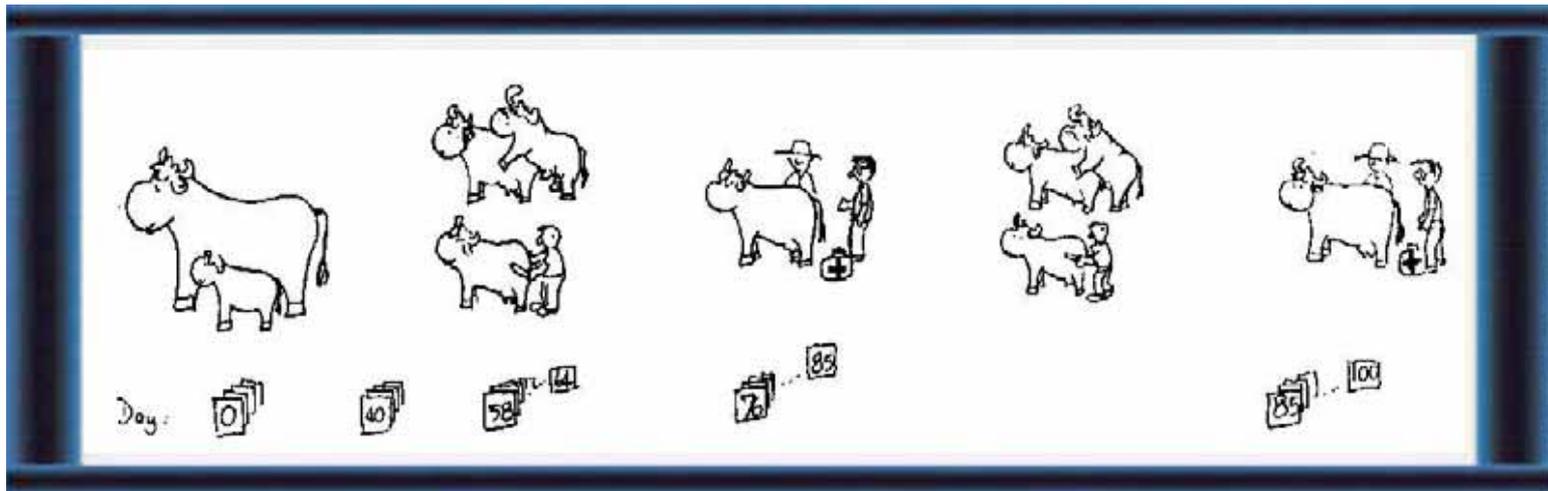
(1) (2) (3)



21 You need to **add the breeding sign** for **each** cow to your calendar

**when** she is bred by A.I. or by natural service (bull).

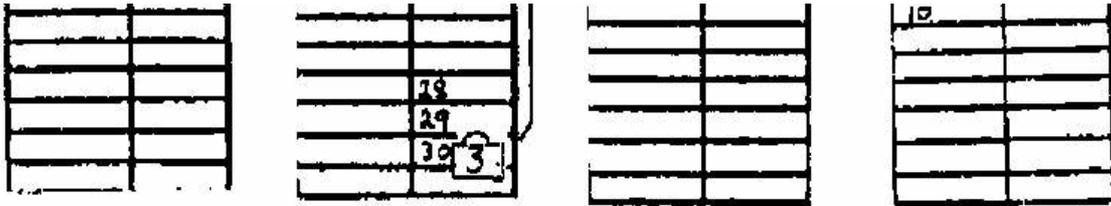
For example **cow (3)**, see next page.



<p><b>You know when cow 3 calved. Mark it with calving symbol 3</b></p>	<p><b>Look for heat after 40 days calving. When you observe heat, place breeding sign 3 - 18 to 24 days later. (1st breeding: 2nd heat after calving)</b></p>	<p><b>Look for heat again about day 56-64. If you observe heat, mate or inseminate. Move breeding sign to actual day of breeding.</b></p>	<p><b>Look for heat about 3 weeks after breeding. If no breeding ask the vet to check for pregnancy after 45 days. If heat repeat breeding.</b></p>	<p><b>If your cow continues to show heat after breeding 3 times, ask the vet to check for reproductive disorders.</b></p>
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**Cows should become pregnant again 60-90 days after calving.**





2. Expected calving date is about 9 months counted forward from the date of breeding, which is marked with a calving symbol at the expected date. Owing to individual variations, calving may take place some days sooner or later than expected. After calving the symbol is moved from the expected to the actual date. (25-26)

**Example:** Cow no. 4 mentioned above was expected to calve around the 20th July, 1987. The following entry was thus made on the 1987 calendar:

JULY	
1	17
2	18
3	19
4	20
5	21
6	22
7	23
8	24
9	25
10	26
11	27
12	28
13	29
14	30
15	31
16	

**4**

CALVING SYMBOL, (expected)

COW NO. 4

3. From the calving date the drying off date can be calculated, counting forward the appropriate number of months. A drying off symbol, marked with the cow's number, can then be entered on the calendar. (27-28)

**Example:** Cow no. 4 mentioned above calved around the 20th July, 1987. At calving, the date of drying off was calculated to be around 20th May, 1988. The following entry was made on the 1988 calendar:

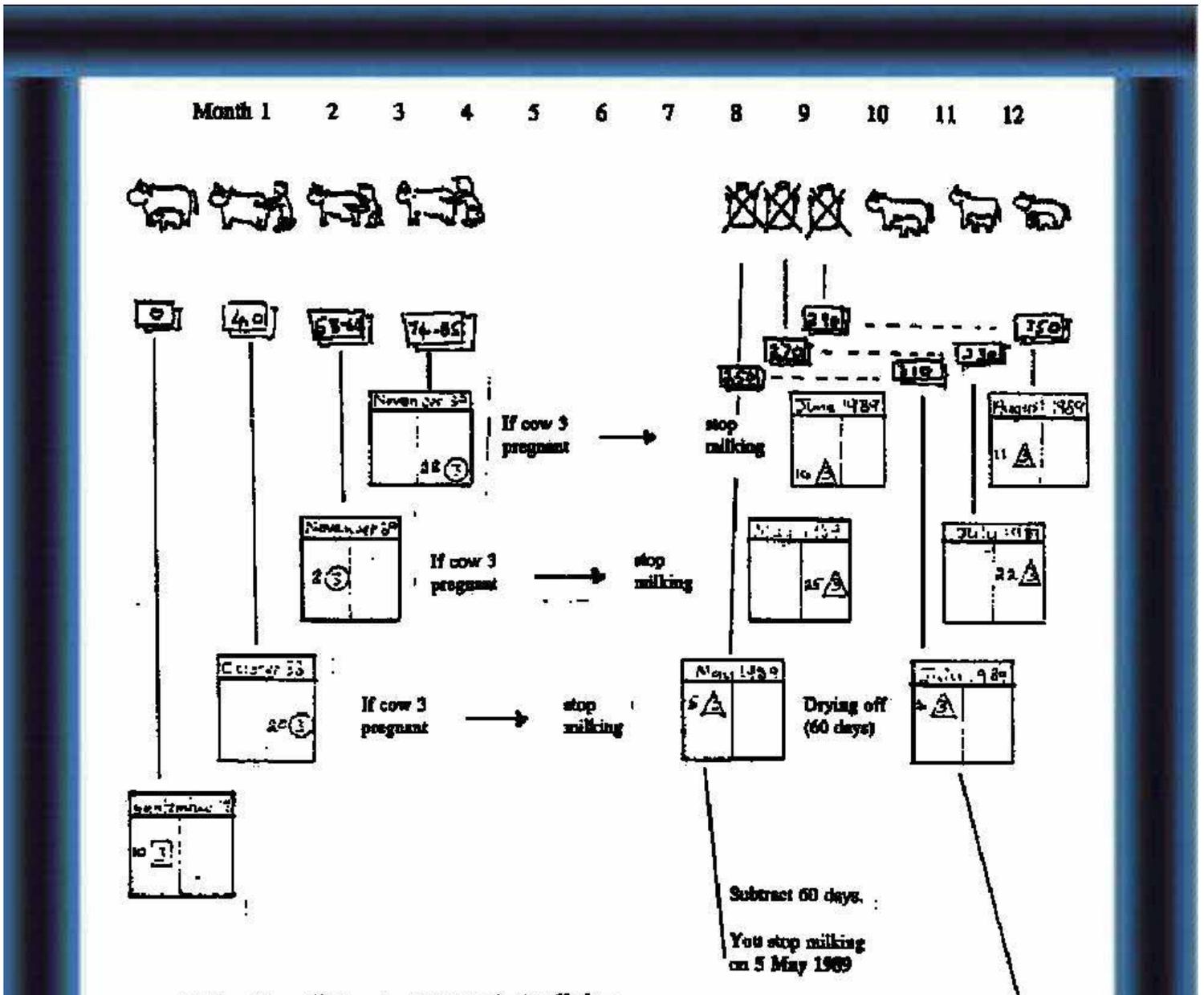
MAY	
1	17
2	18
3	19
4	20
5	21
6	22
7	23
8	24
9	25
10	26
11	27
12	28
13	29
14	30
15	31
16	

(Note: This may have to be changed subsequently, depending on the date of successful service because the requirement is to allow a two-month dry period before next calving).



your cow 60 days before estimated calving.

This makes sure your cow and the calf are strong at calving.



on 3 May 1969

Put the drying off sign 3 on your calendar 60 days before you estimate calving. For example, you estimate calving for cow 3 on 4 July 1969

page 68

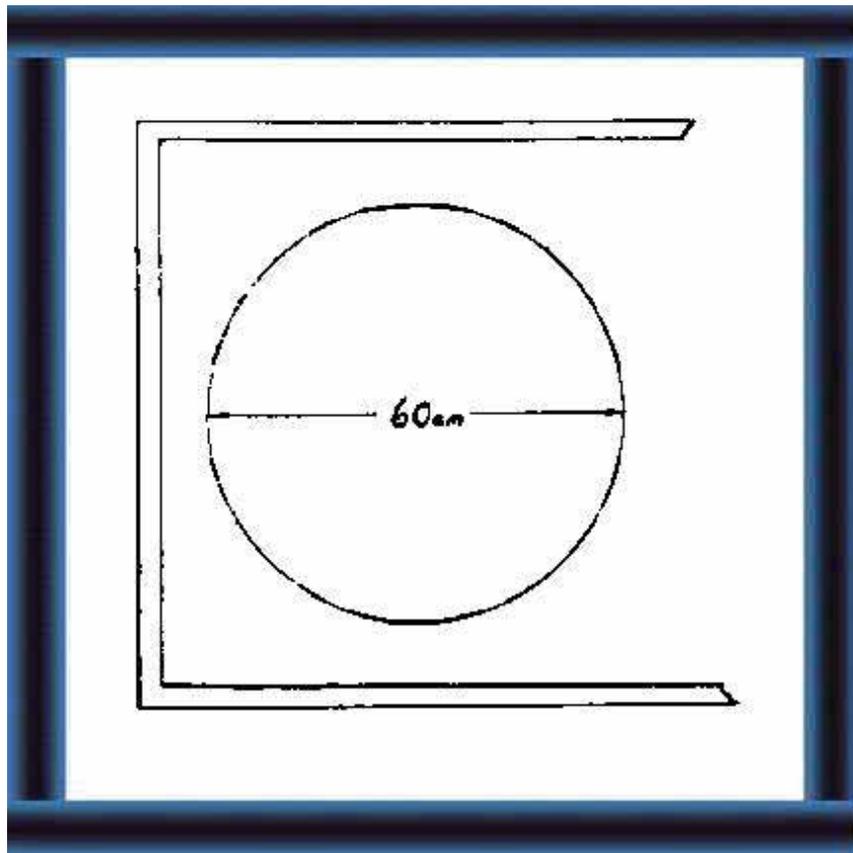
## Breeding calendar 2

### Principle

1. You need a soft, wooden board (recommended measurements: 110 cm x 80 cm) and a flannel cloth to cover the board. (about 120 cm x 90 cm).

Also you need 80 pins and string in 2 colours (about 20 m od each). (29)

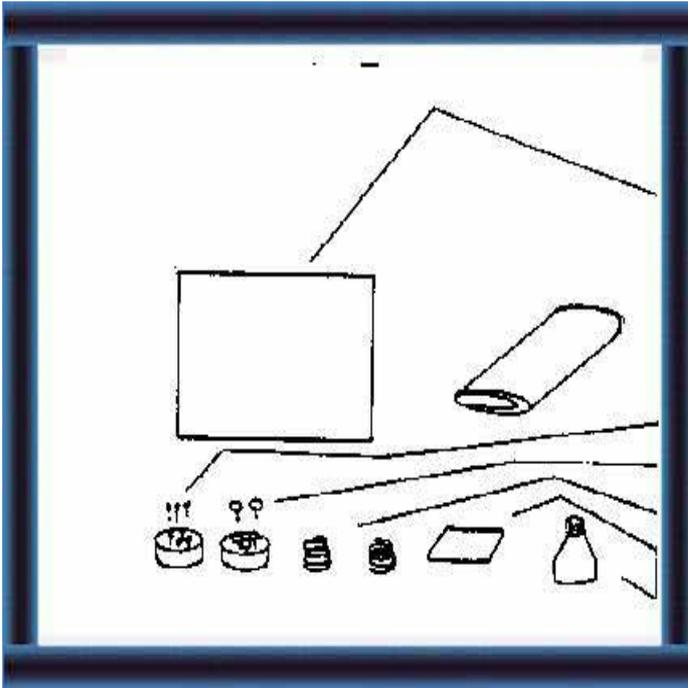
2. Glue the flannel on the board and draw circle of about 60 cm diameter. (30-31)



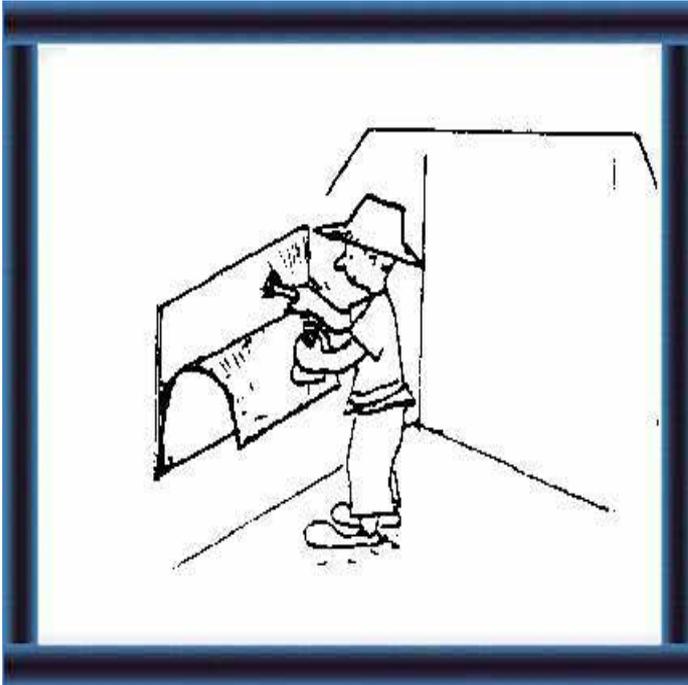
3. Divide the circle into 12 months by marking every 15.5 cm of the circle with a pin. Also put a pin in the centre of the circle. (32)

page 69

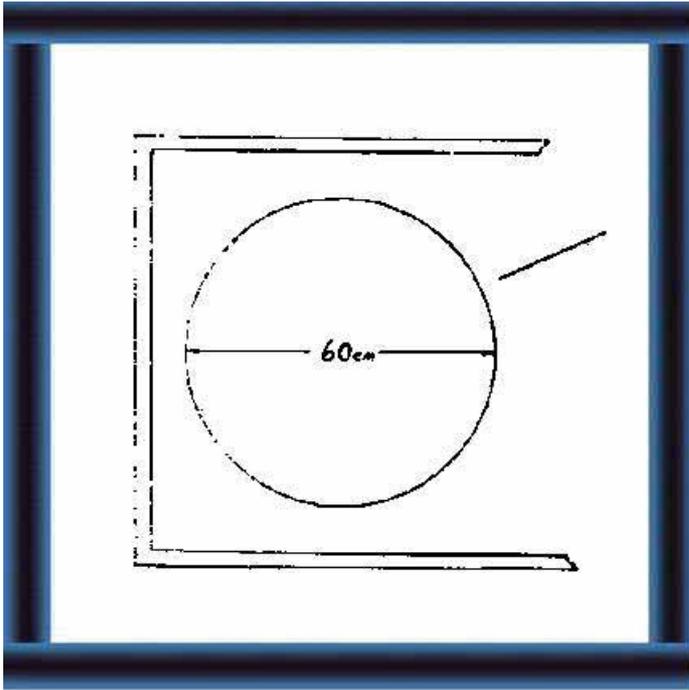
## Breeding calendar 2



29. You need:
- a soft wooden board, about 80 x 110 cm
  - a flannel cloth, about 90 x 120 cm
  - 80 pins (plain)
  - coloured pins (4 colours) 4 for each of your cows
  - string (2 colours)
  - sticky paper
  - glue.

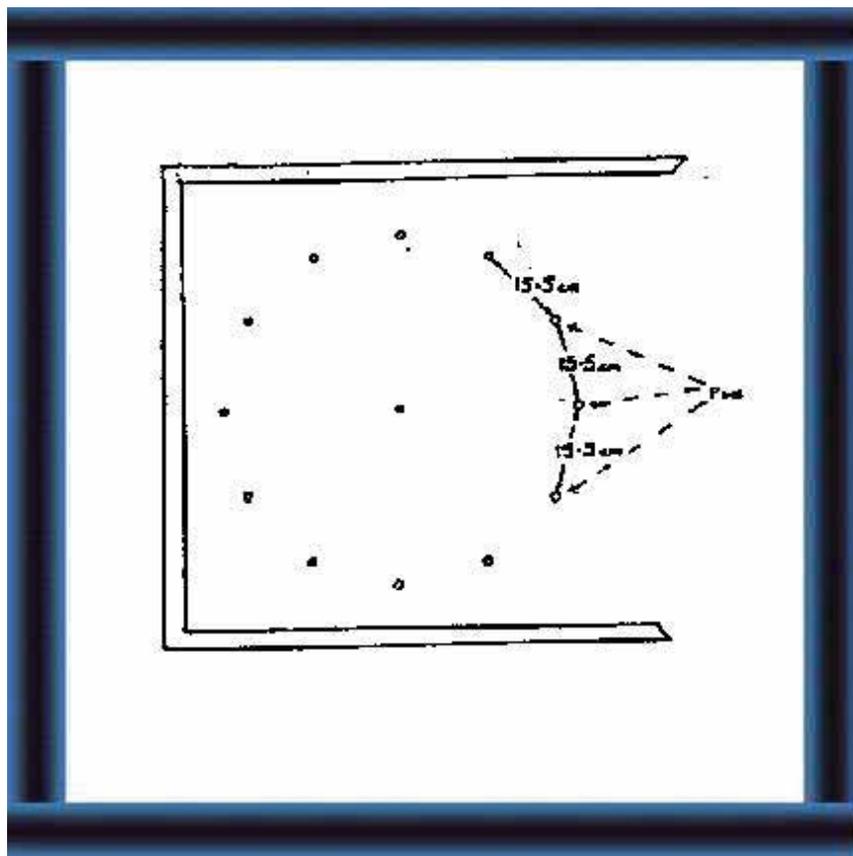


30. Glue the flannel cloth to the board.

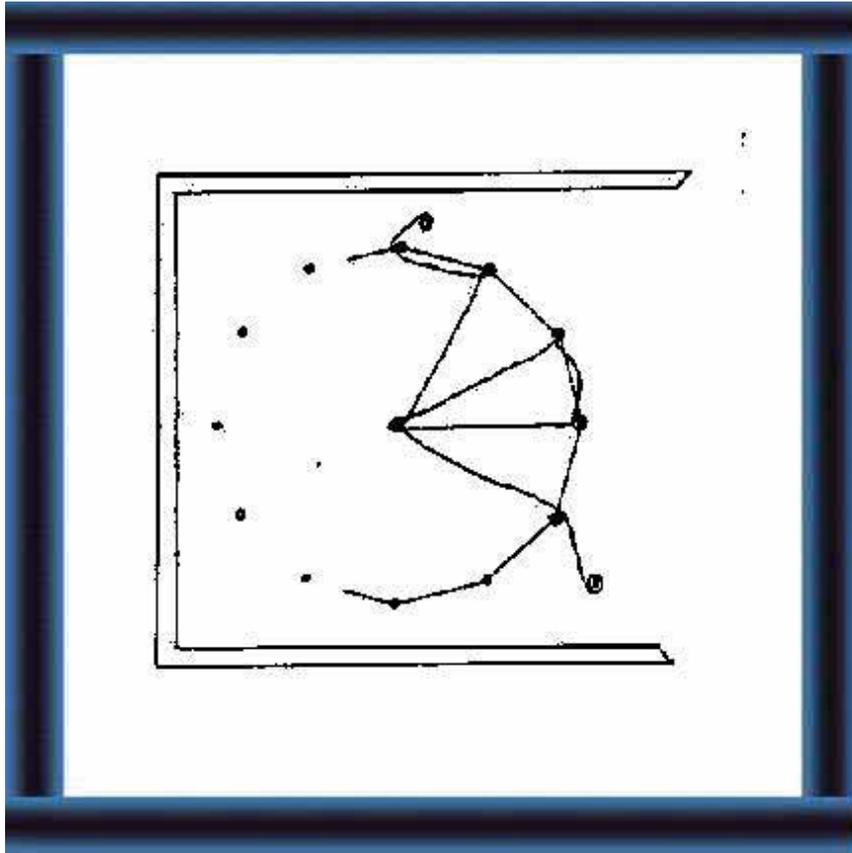


31. Draw a circle about 60 cm in diameter.

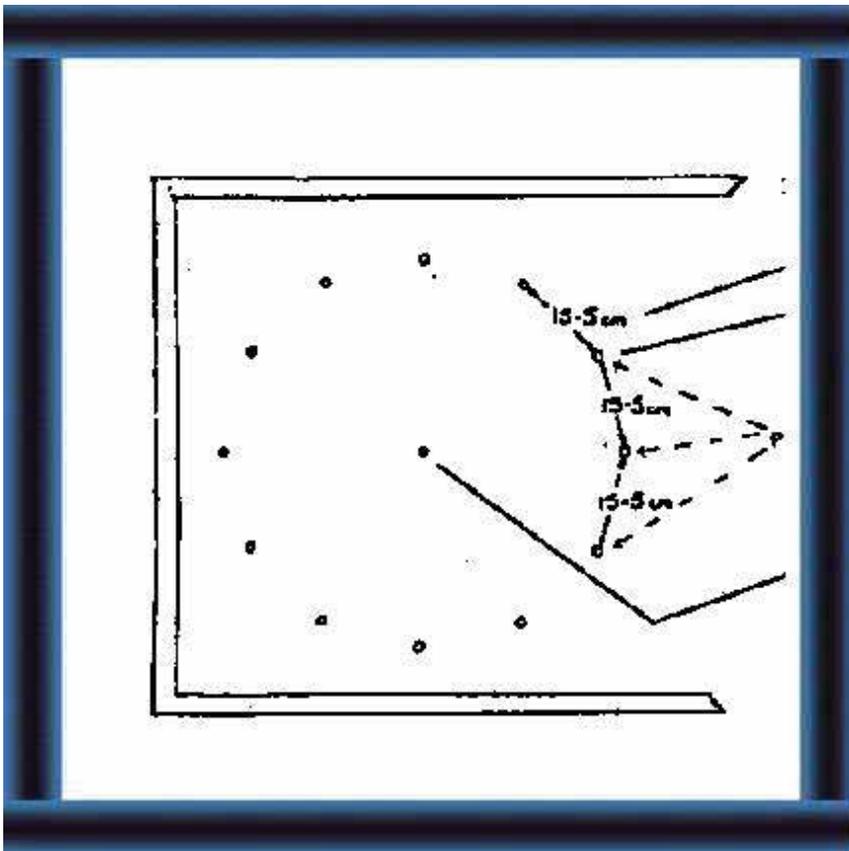
page 70



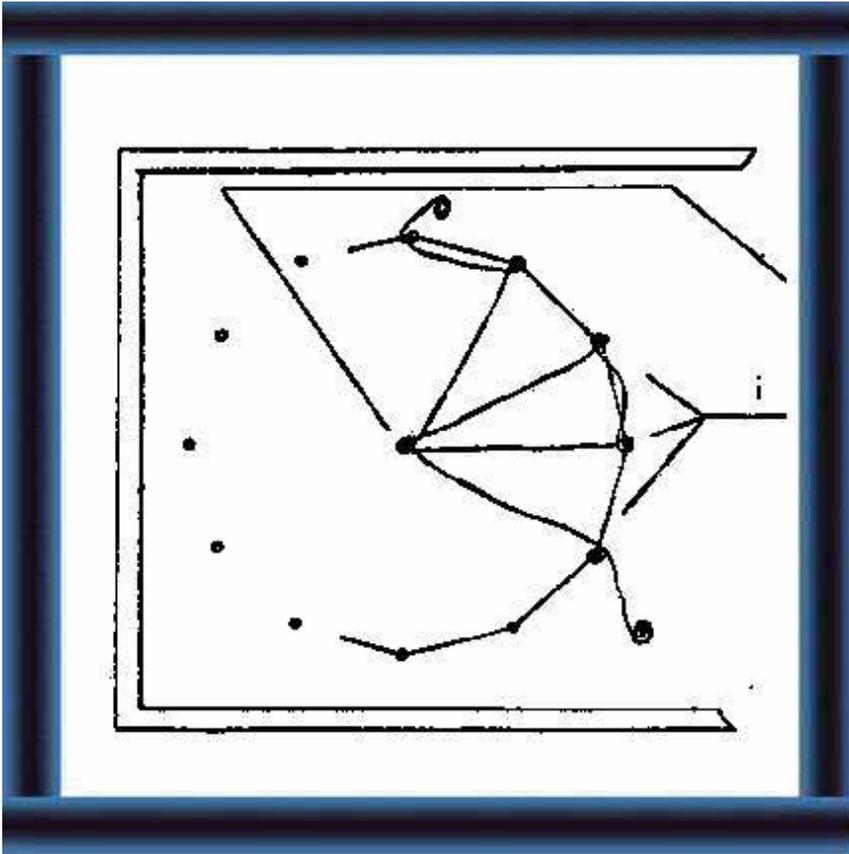
4. Tie a string (same colour) between the corner pins and also between each corner pin and the centre pin (33)



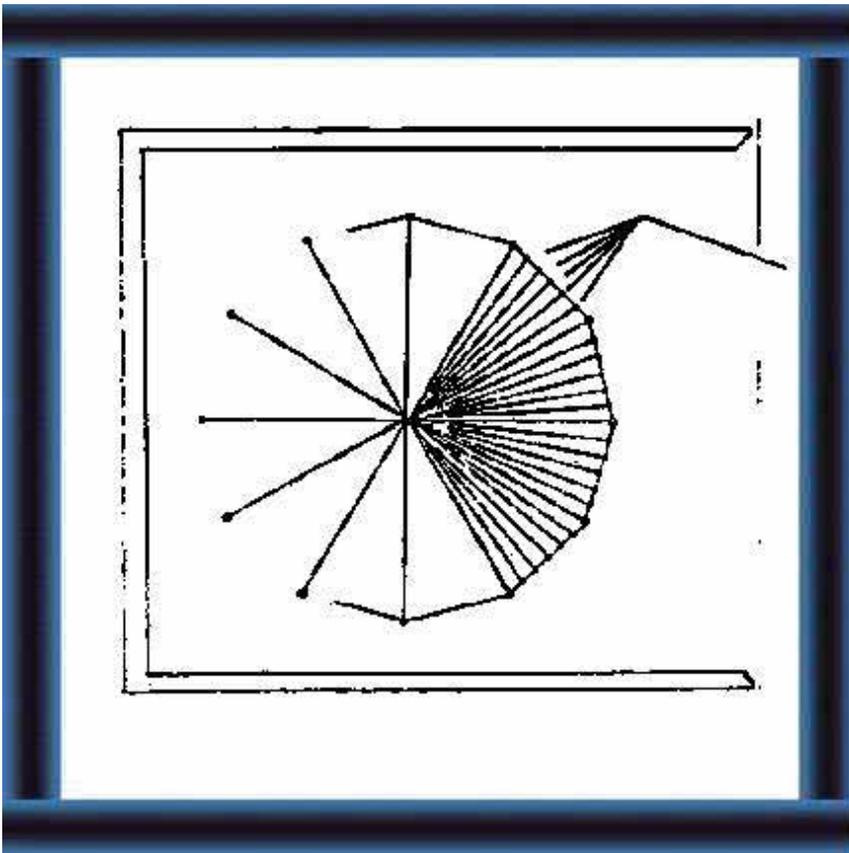
page 71



32 **Divide** the circle into 12:  
- make each length **15.5 cm**  
- mark each length with a pin.  
Each length = **1 month**.  
Put a pin in the **centre** of the circle.



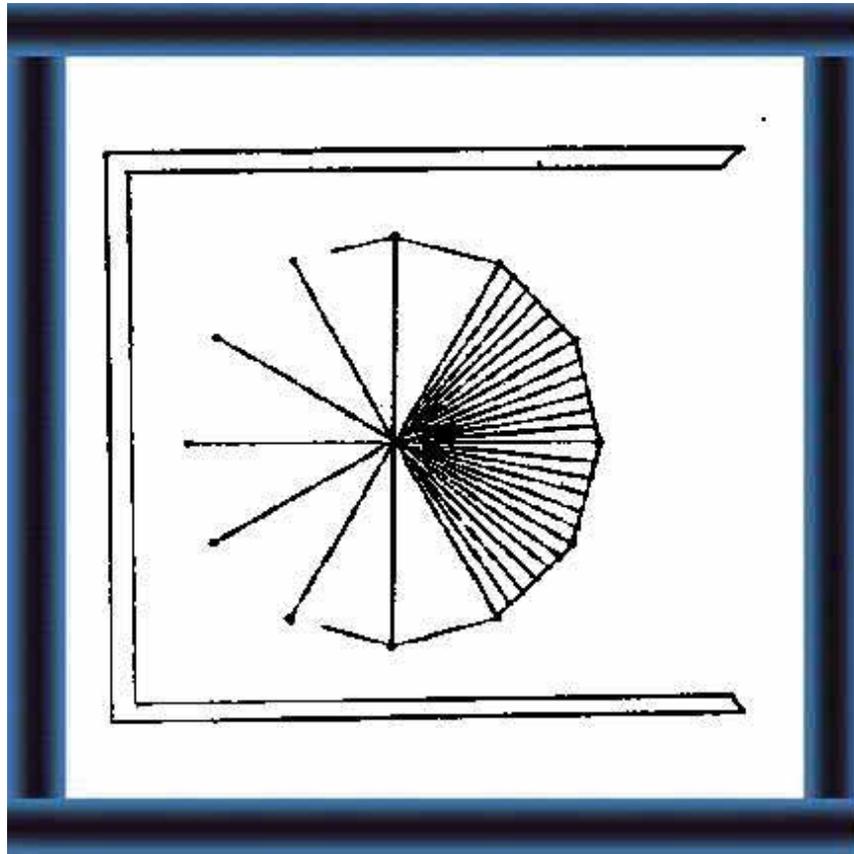
33 Tie a string of the same colour from:  
- the **centre pin** to  
- **each** of the 12 pins on the circle.



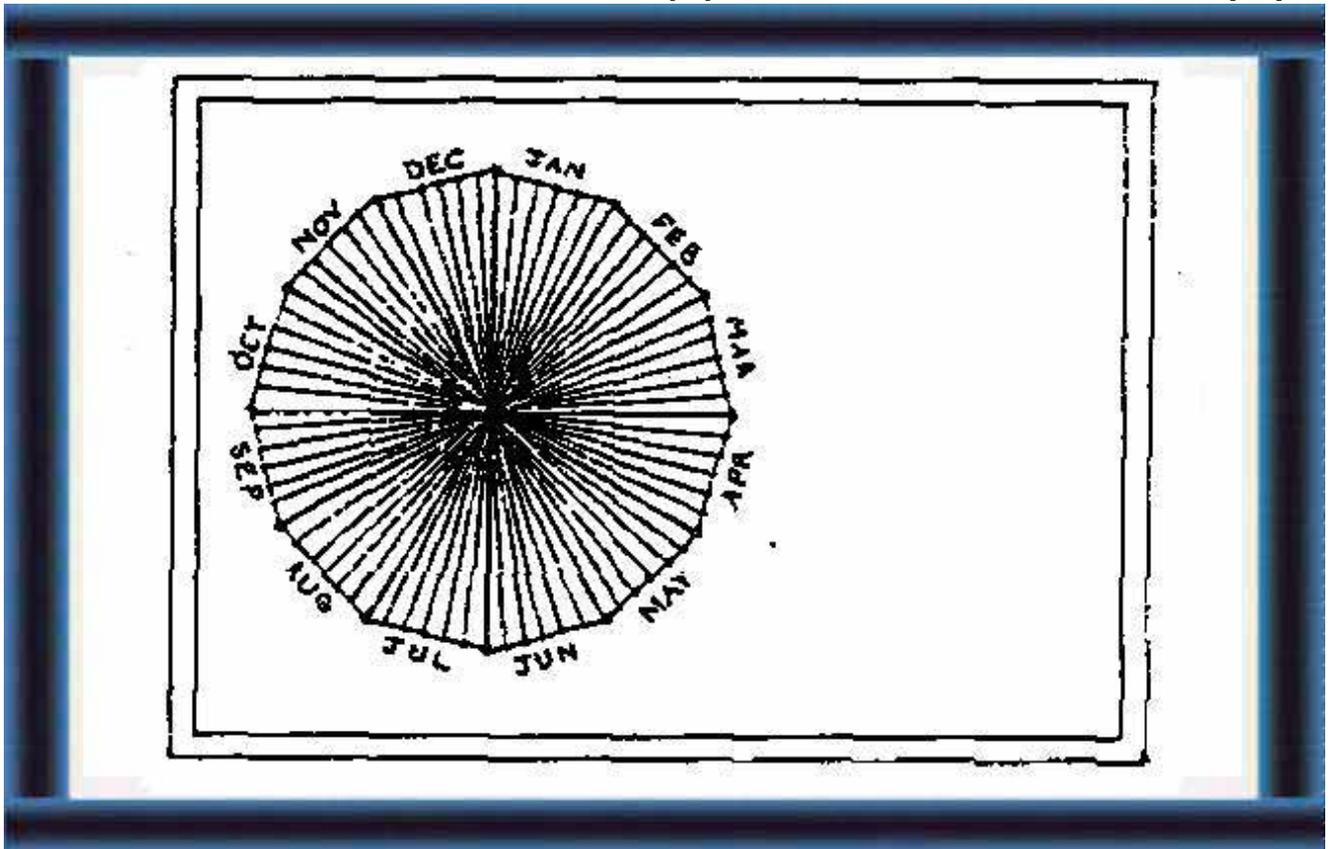
34 Divide **each month** (each 15.5 cm) into **6 parts**:  
- place 5 pins at equal spaces between each end pin (in 31).  
- Tie a string of a **different colour** (from 31) to each of these 5 pins.

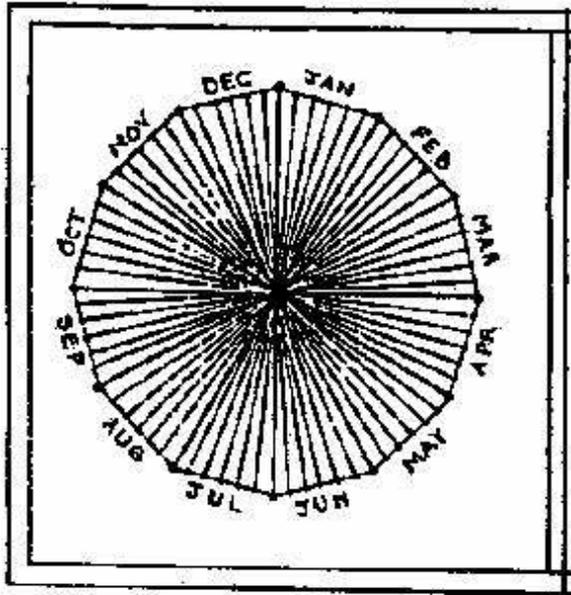
5. Divide each month into 6 parts by placing 5 pins placing between each corner pin. (34)

Connect each of these pins to the centre pin with the string of the other colour.

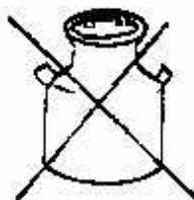
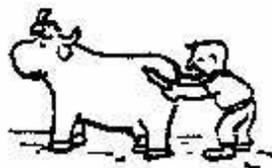
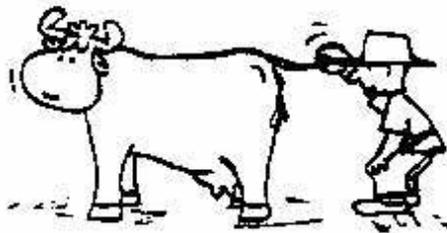


6. Write the name of each month on adhesive paper and stick them on the calander. (35)





35 Write the **name** of each month on **sticky paper** and label your calendar.

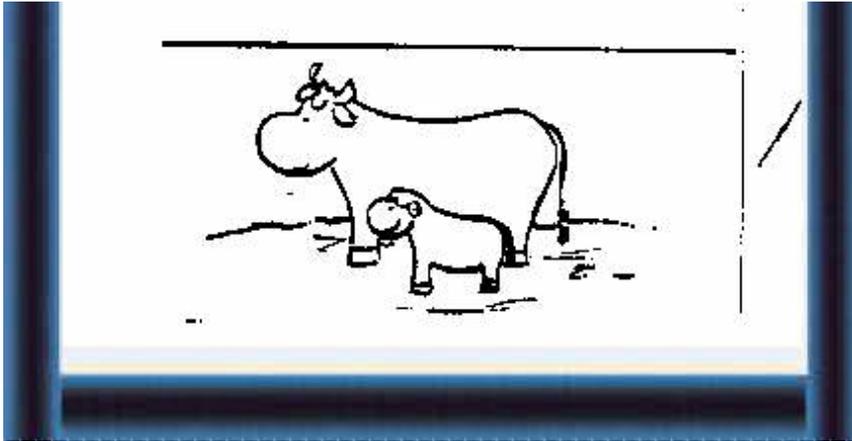


36 You need to make **4 signs** for your calendar, write them on the sticky paper:

**Heat** - blue pin

**Breeding** - yellow pin

**Drying off** - red pin



Calving - green pin

page 74

**7. There are four events in a cows cycle that need to be recorded on the breeding calendar:  
(37-38)**

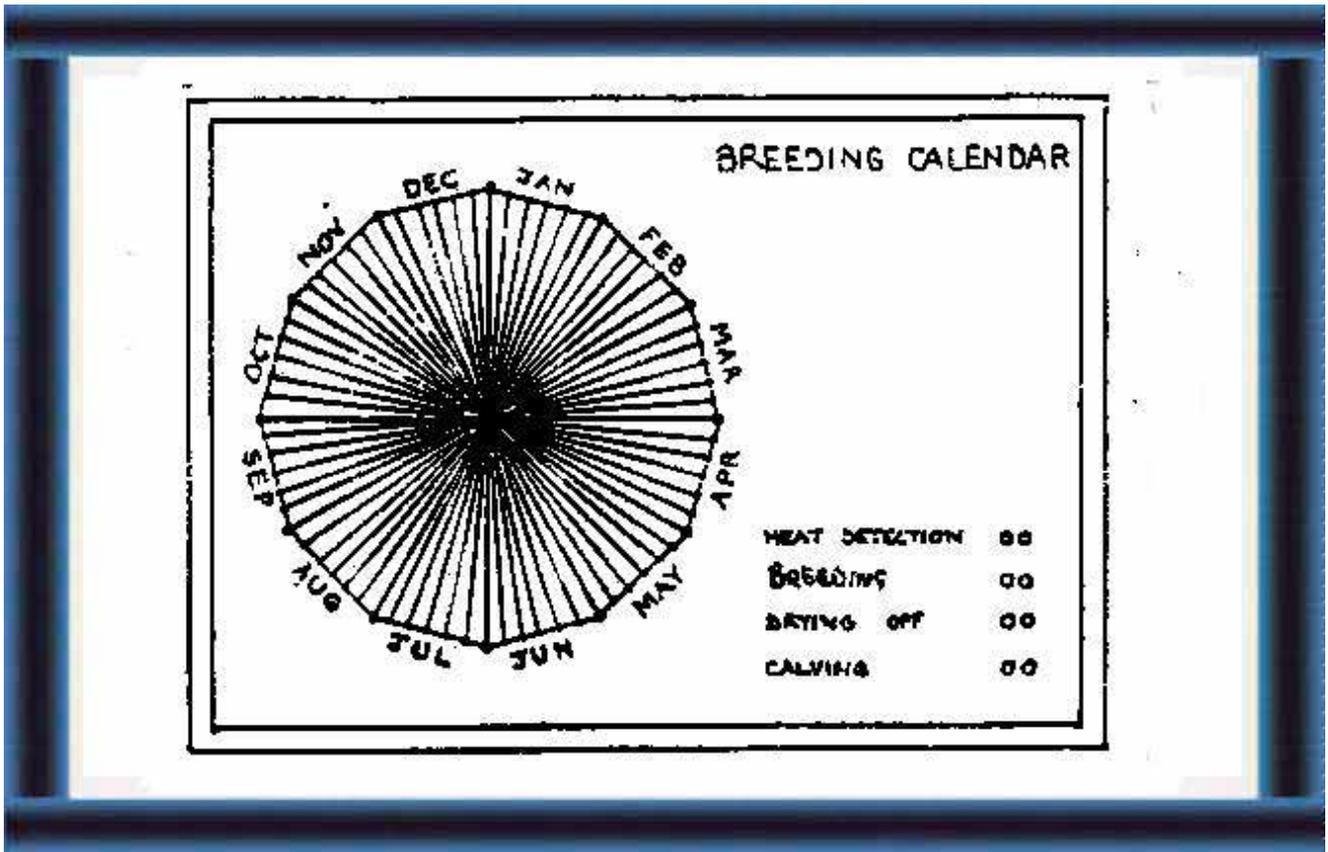
- Heat detection - to look for heat signs.
- Date of breeding (mating or AI).
- Drying off - to stop milking a cow two months before calving.
- Calving date.

**Different colours are used, blue, yellow, red and green, to symbolize the four events.**

**Make four labels from self-adhesive paper, and write on them:**

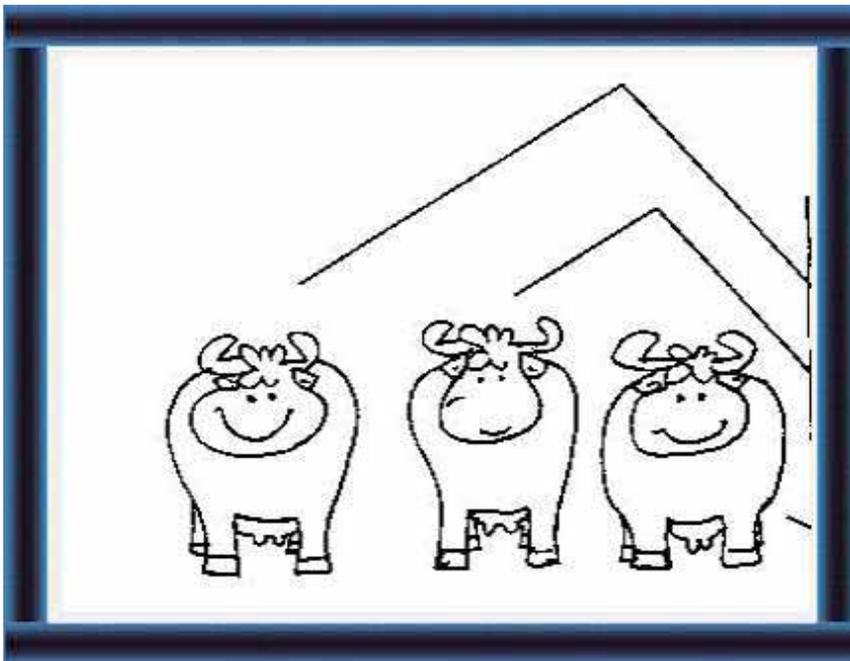
- Heat Detection Blue pin
- Breeding (mating/AI) Yellow pin
- Drying Off Red pin
- Calving Green pin

**Stick the labels on the board. Put a blue pin next to the "Heat Detection" label, a yellow pin next to "Breeding", a red pin next to "Drying Off" and a green pin next to the "Calving" label.**

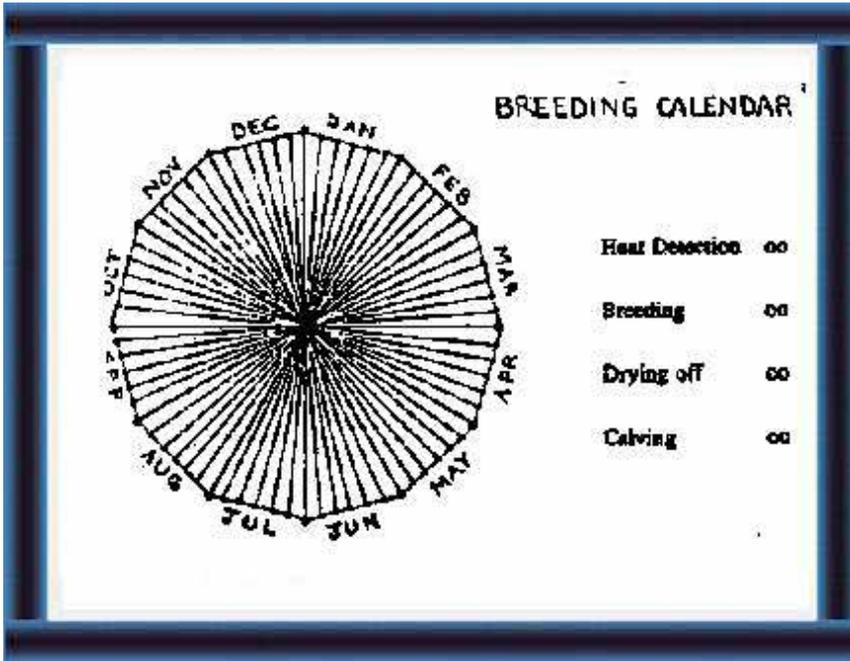


8. Each cow in a herd needs an identification number, i.e. no. 1,2,3,4,5 and 6.

page 75



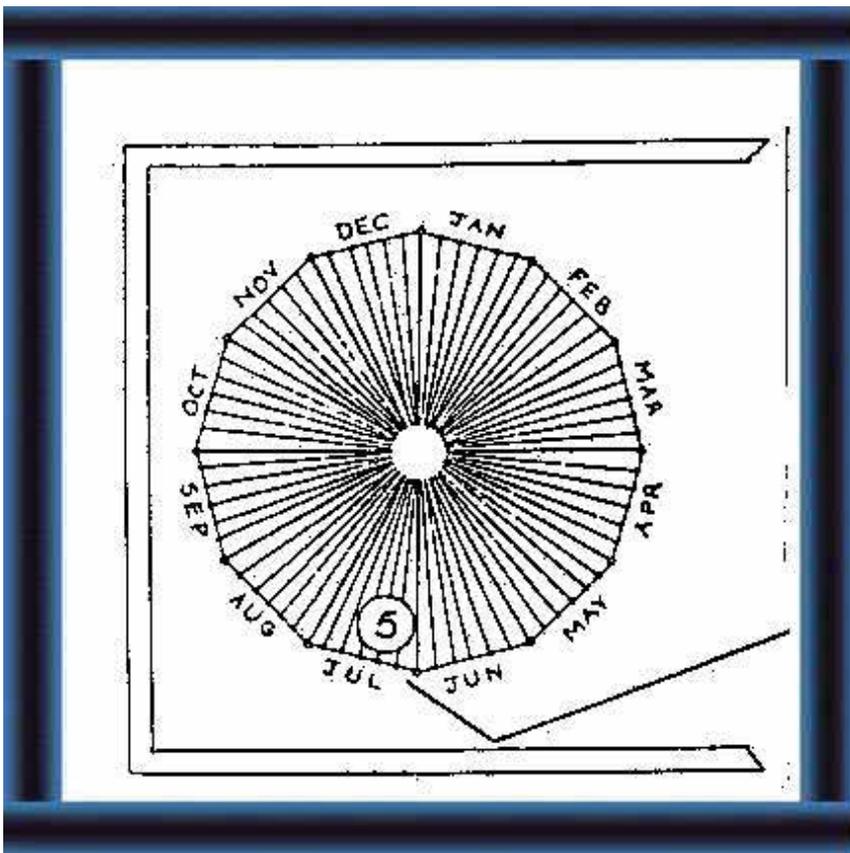
37 Give **each** of your cows a **number** and mark **one pin** of each **colour** with the number.  
blue yellow red  
green



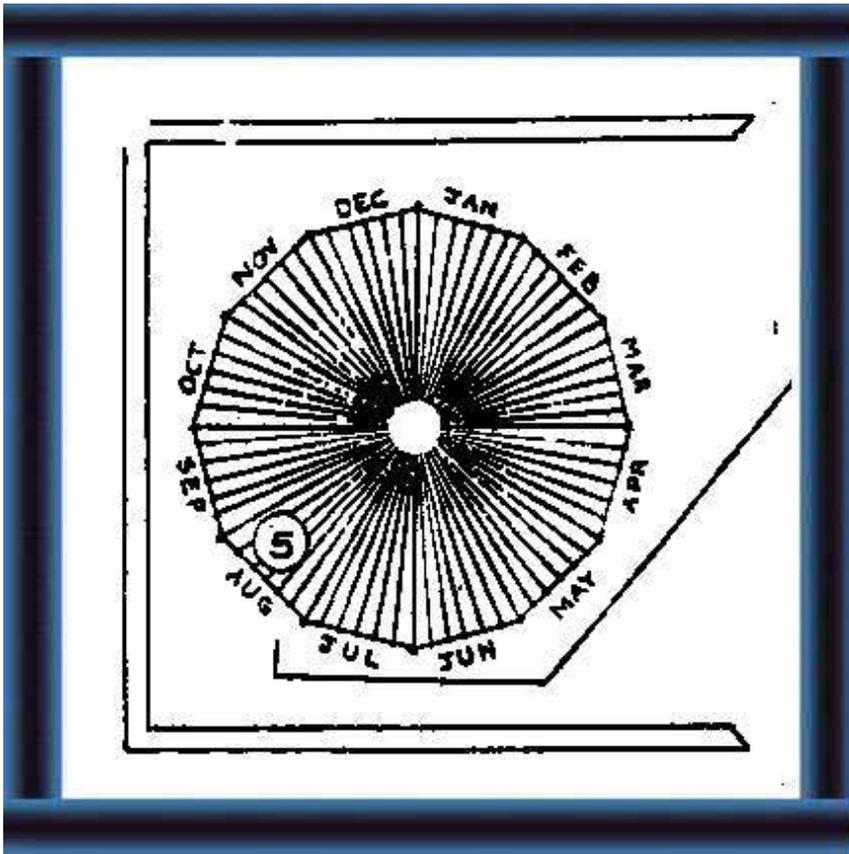
38 Stick the 4 labels onto your calendar and put a pin of the correct colour next to each label:

Heat detection blue pin  
Breeding yellow pin  
Drying off red pin  
Calving green pin

### How can you use breeding calendar 2?



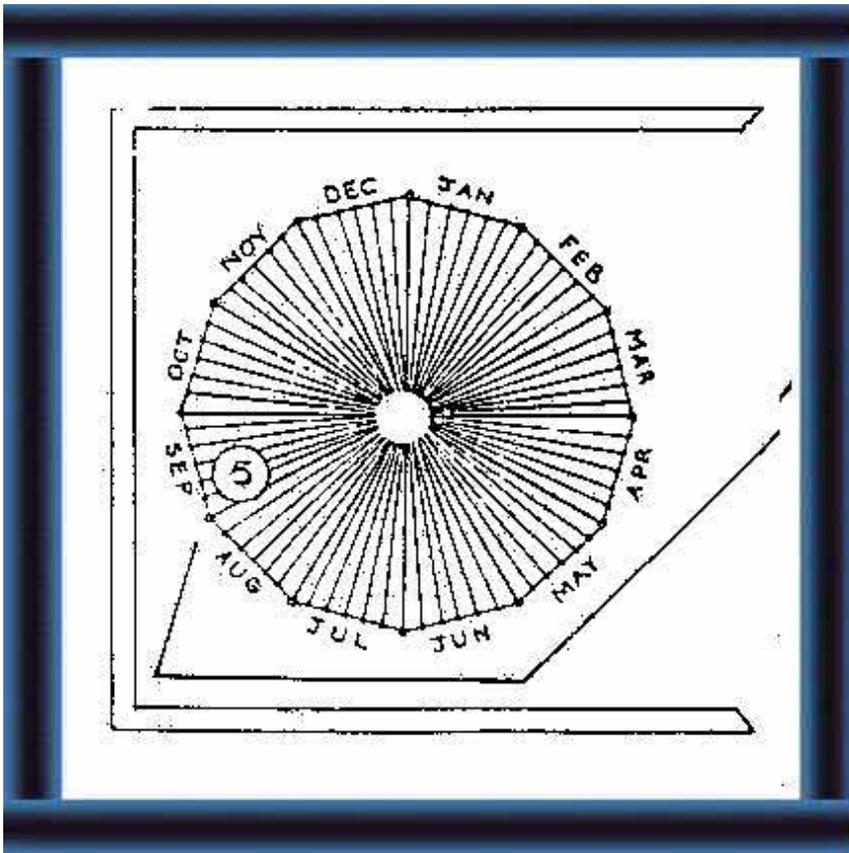
39 When one of your cows **calves**, place a **green pin** with the cow's number on the date. For example, if cow 5 calves on 10 July, place **green pin 5** on that date.



40 You know the 1st heat is about **40 days** after calving.

So for cow 5, place **blue pin 5** 40 days after 10 July, on 20 August.

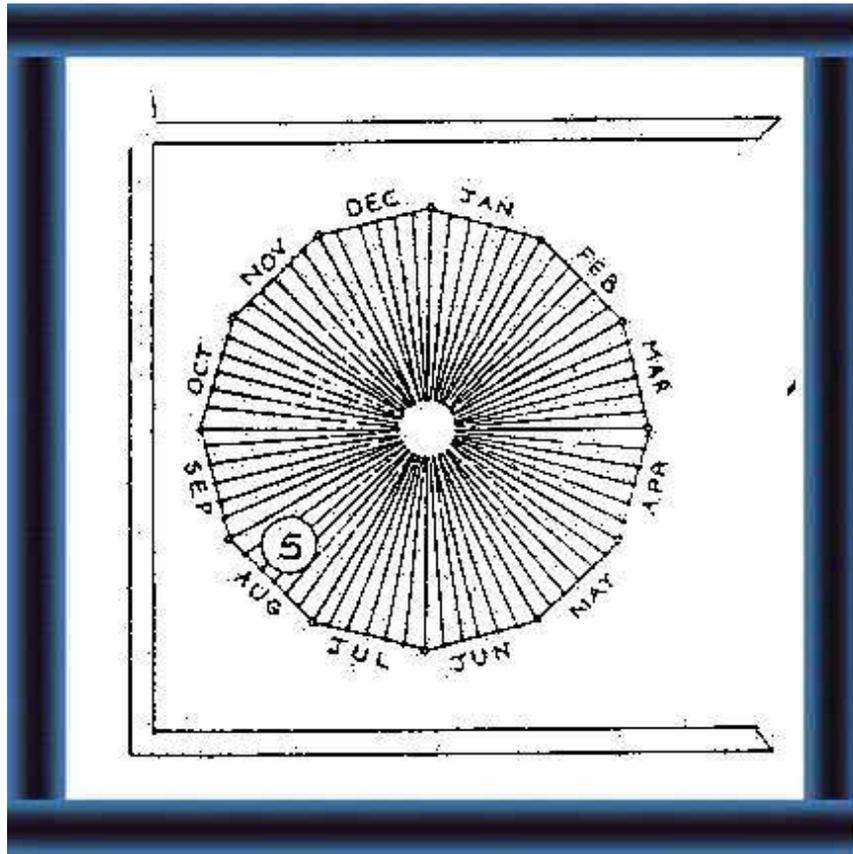
This will tell you **when to look for signs of 1st heat.**



41 You know the 2nd heat is about **21 days** after the 1st heat.

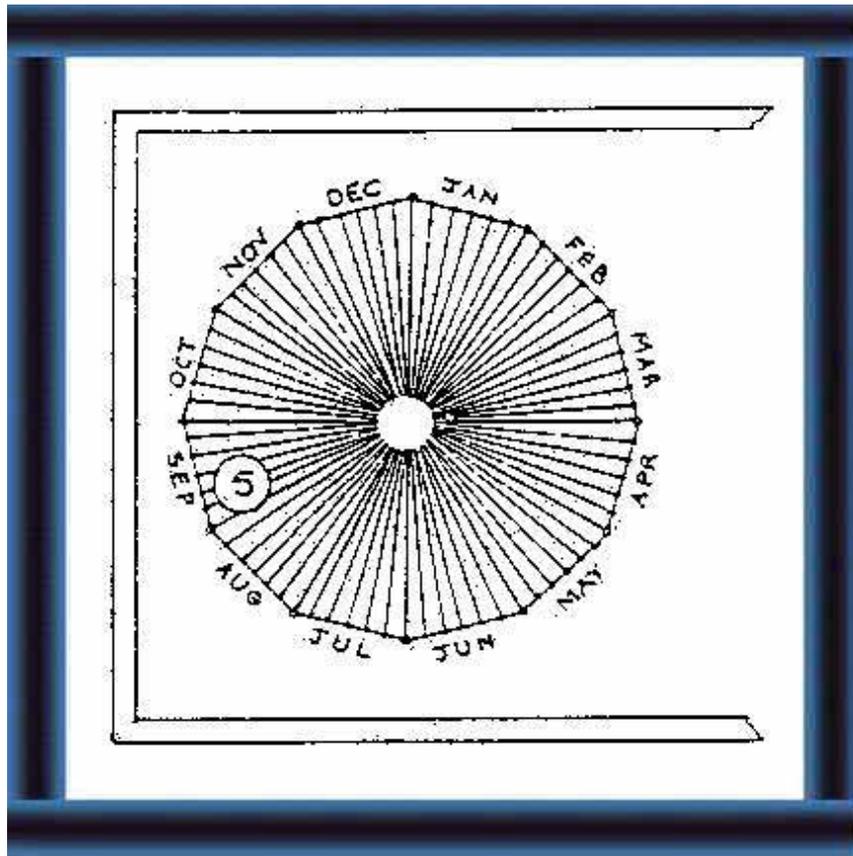
So when cow 5 shows first heat, move **blue pin 5** 21 days forward, to **10 September.**

This tells you **when to look for signs of 2nd heat.**



**3. If the cow shows heat about 40 days after calving you move the blue "heat detection" pin forward 21 days after heat observation. Then you remember to look for the second heat after calving. (41)**

**Example:** If cow no. 5 shows heat signs 40 days after calving, on August 20th, move the blue "heat detection" pin marked 5 to September 10th.

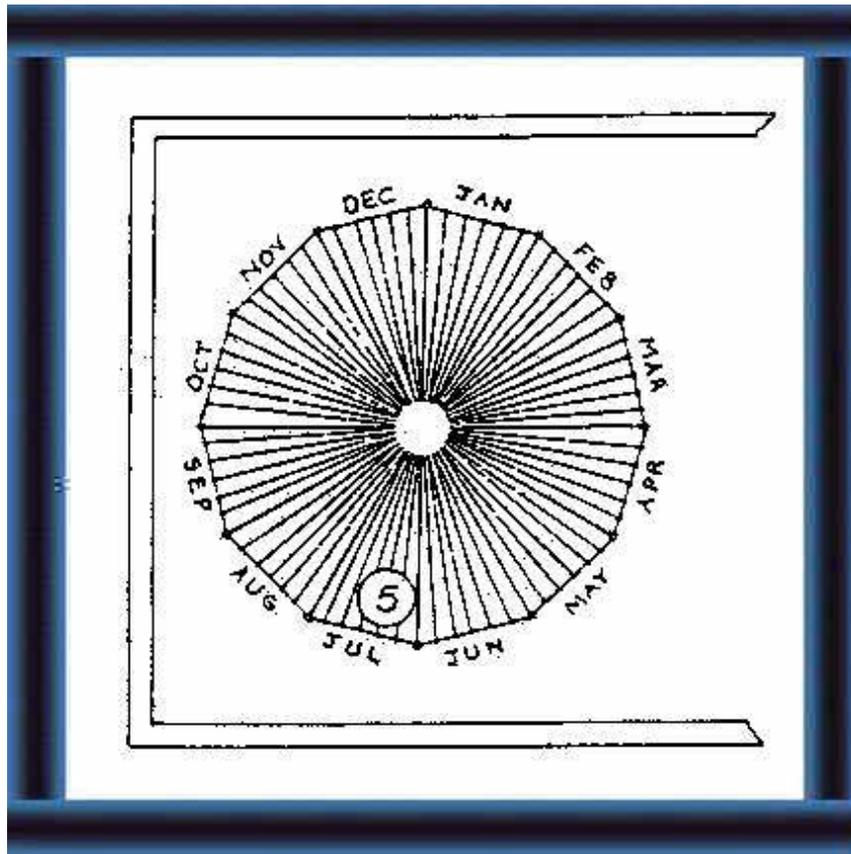


Each cow needs four pins, one in each colour. Mark the pins with the cow's identification number.

### How to use the calendar?

1. When a cow calves you place a green "Calving" pin, marked with the cow's number, on the day of calving. (39)

**Example:** If cow no. 5 calves on July 10th, a green pin marked 5 is placed in position July 10th on the calendar.



2. A cow normally shows heat about 40-42 days after calving. When a cow calves, also put a blue "heat detection" pin, marked with cow number, on day 40 after calving. (40)

**Example:** If cow no. 5 has calved on July 10th, place a blue "heat detection" pin on August 20th. This will be a reminder to look for signs of heat around August 20th. (If the cow does not show any signs of heat by 60 days after calving, the extension officer or veterinarian should be consulted.)

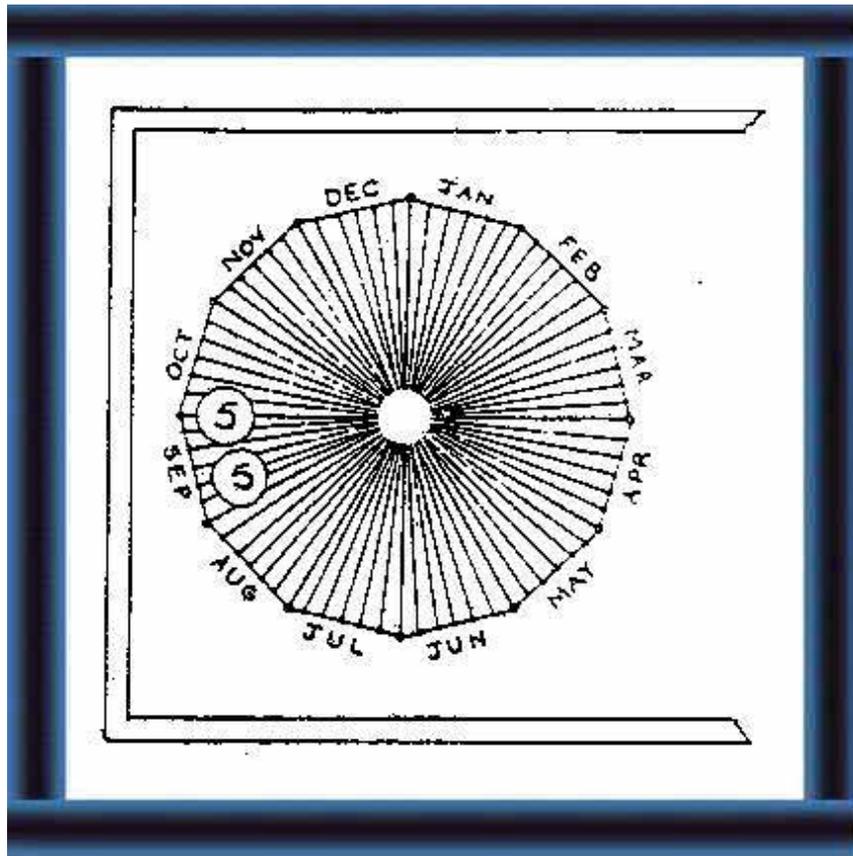
page 79

4. If the cow shows second heat after calving 21 days later (about 60 days after calving) breed her and place a yellow "breeding" pin on the day of breeding. (42)

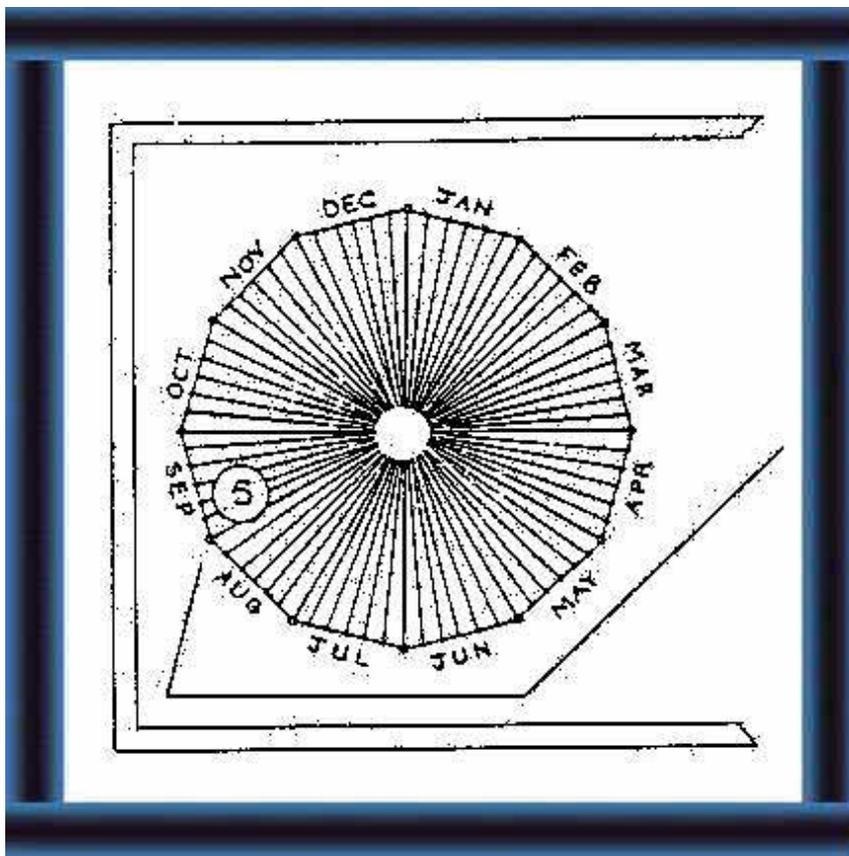
When the cow has been bred (mating or A.I.) it is necessary to look for signs of heat 21 days later. So put the blue "heat detection" pin 21 days after breeding. (43)

If the cow does not become pregnant and shows heat 21 days after breeding, she can be bred again (2nd breeding). Then put a blue "heat detection" pin 21 days after 2nd breeding.

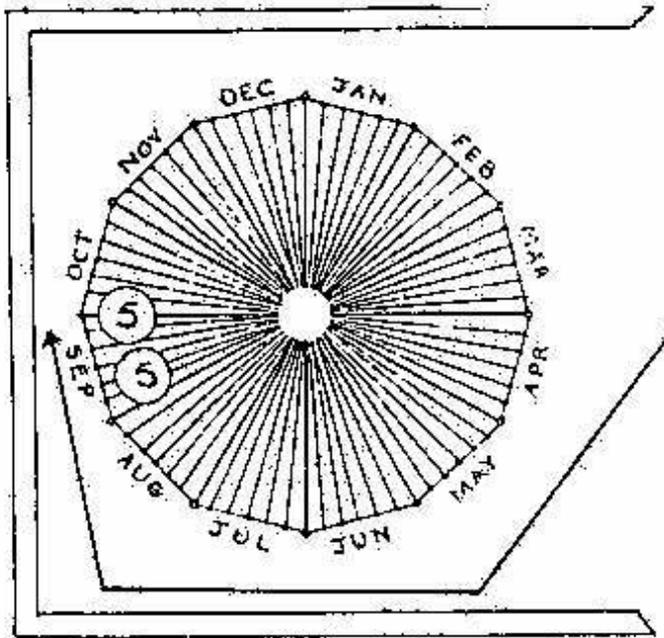
**Example:** If cow no. 5 shows heat signs on September 10th she will have to be inseminated. Put the yellow "breeding" pin marked 5 on September 10th. Also put a blue "heat detection" pin on October 1st, as a reminder to look for heat signs 21 days later, in case the cow did not get pregnant. If she shows heat on October 1st she should be inseminated again.



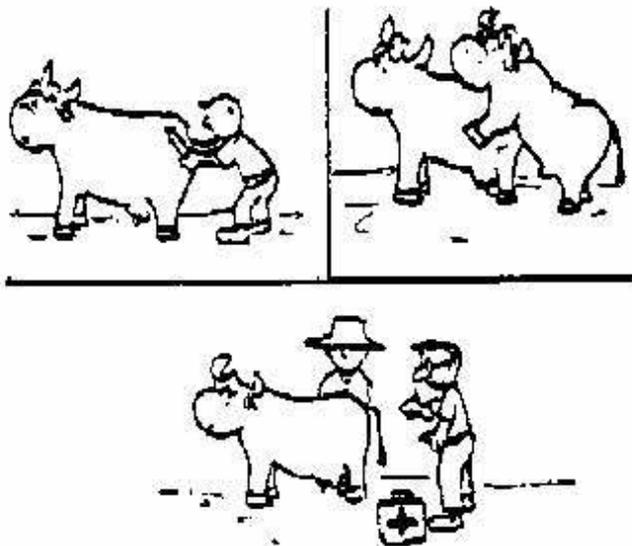
page 80



42 When you observe signs of **2nd heat** (around September 10) **inseminate or mate her.** Replace **blue (heat) pin 5** with **yellow (breeding) pin 5** on the date of **breeding.**



43 You know the 3rd heat is about **21 days** after the 2nd heat. So after breeding her (2nd heat) move **blue pin 5** 21 days forward to 1 October. This tells you when to look for **signs of 3rd heat**.

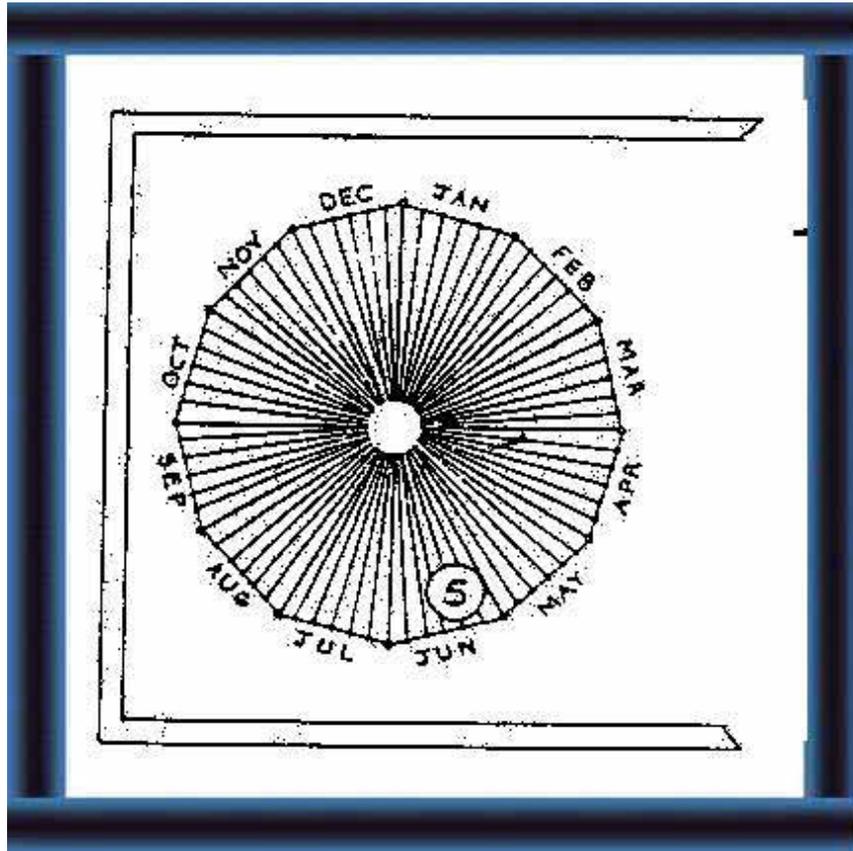


44 If your cow shows heat signs around 1 October, **inseminate or mate her again**. If she shows **no heat signs**, she may be pregnant.

**5. If the cow does not show heat 21 days after breeding she may be pregnant. Move the green "Calving" pin to the expected day of calving about 9 months (average, Holstein:279 days) after breeding. (44-45)**

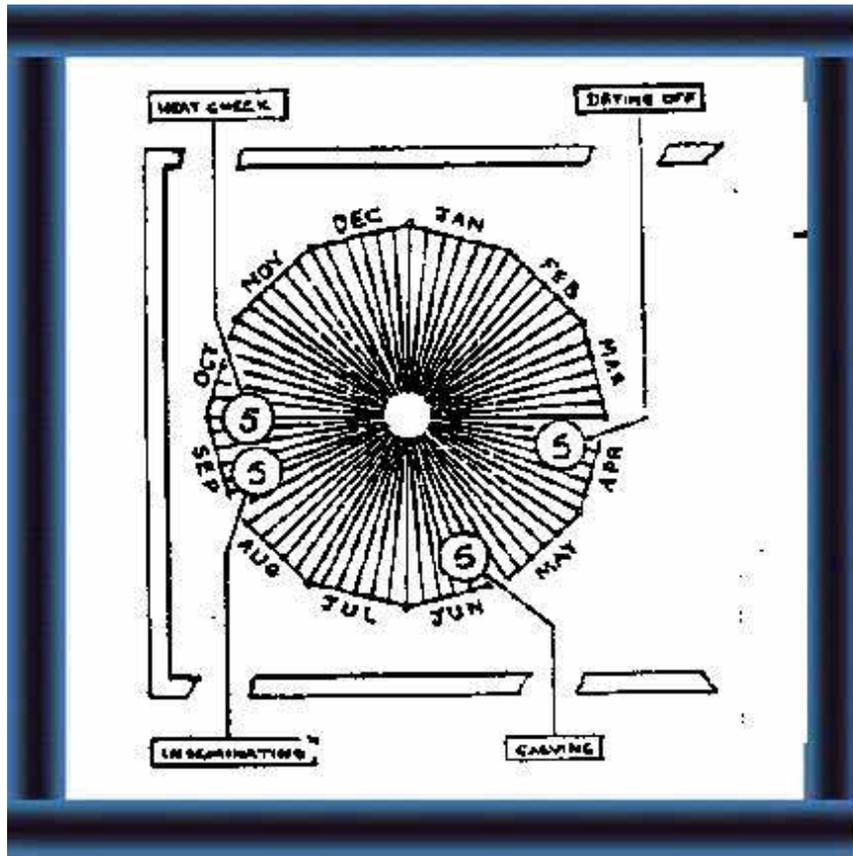
**Ask the inseminator or veterinarian to confirm pregnancy about 45 days after breeding.**

**Example:** If cow no. 5 is inseminated on September 10th and does not show heat later, she will be expected to calve about 9 months (or 279 days) after breeding, which will be June, 16th the following year. Move the green "calving" pin marked 5 to June 16th on the calendar.

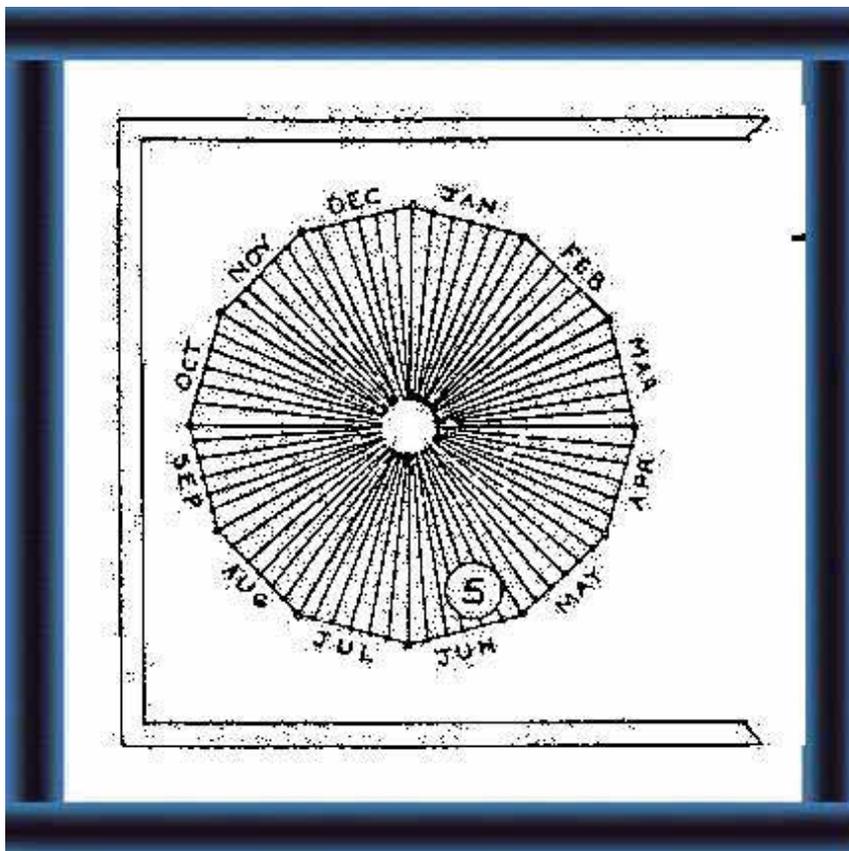


**6. A cow should not be milked the last two months before calving. The cow needs time to build up her body before next lactation period. When a cow is pregnant, place a red "drying off" pin on the day 2 months before expected calving. (46)**

**Example:** If cow no. 5 is expected to calve on June 16th, place a red "drying off" pin on April, 16th.



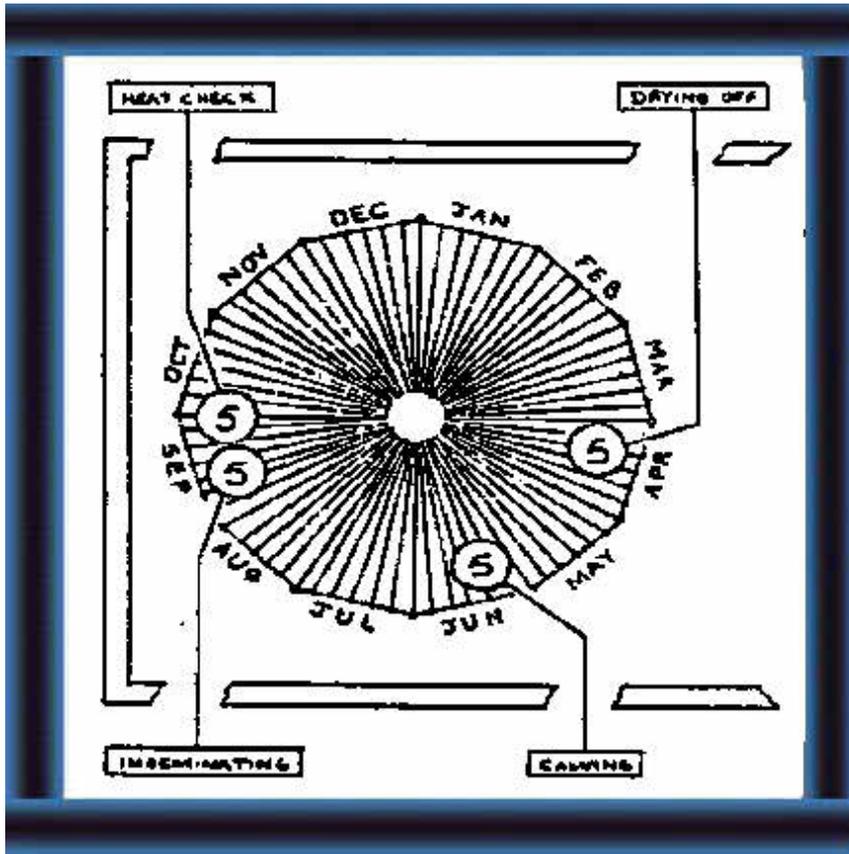
page 83



45 If you think your cow is **pregnant**, place **green (calving) pin 5** about **9 months** after breeding (about 279 days for Holstein), on 16 June, the next year.

**Important**

Ask your inseminator or vet to confirm pregnancy about **45 days** after breeding.



page 84

46 You know you should stop milking **2 months before** estimated calving. Place **red (drying off) pin 5** 2 months before 16 June, on 16 April. These two breeding calendars are

- cheap
- easy to make
- easy to use.

They are suitable for small farms. For bigger herds, consult your extension worker on how to make or buy a suitable breeding calendar.

These two breeding calendars are cheap and easy to make, and simple to use. They can both be used on the small farm to cover recording of breeding for a limited number of cows.

For bigger herds more comprehensive breeding calendars may be necessary. These can also be "home made" or they can be bought. Consult your extension officer.

### **Acknowledgements:**

Breeding Calendar 1 was originally designed by Ms Dorcas Pratt, VSO at RIT Agricultural College, Nan, Thailand.

Breeding Calendar 2 was originally designed by Mr Pairoj Jadsa-dabundit, Teacher at DOVE Agricultural College, Nakorn Sawan, Thailand.

**What do you know about breeding calendars?**

**Use of a breeding calendar**

- Use it to:**
- keep records (5-6)
  - know when to do what (8)

**Calving every year**

- Understand the connection between:** (9-10)
- calving
  - milking
  - breeding
  - drying off

**Breeding calendar 1**

**Breeding calendar 2**

**Construction**

- |                                      |         |                                       |         |
|--------------------------------------|---------|---------------------------------------|---------|
| - materials and equipment            | (11)    | - materials and equipment             | (29)    |
| - the calendar                       | (12-16) | - the calendar                        | (30-35) |
| - breeding, drying off calving signs | (17)    | - heat, breeding, drying off, calving |         |
| - hanging up                         | (18-19) | pins                                  | (36-38) |

**Use**

- |                                 |         |                               |         |
|---------------------------------|---------|-------------------------------|---------|
| - breeding signs                | (20-21) | - calving and heat pins       | (39-41) |
| - looking for heat and breeding | (22)    | - heat and breeding pins      | (42-44) |
| - example of use                | (23-24) | - calving and drying off pins | (45-46) |
| - estimating calving date )     | (25-26) |                               |         |
| - drying off                    | (27-28) |                               |         |





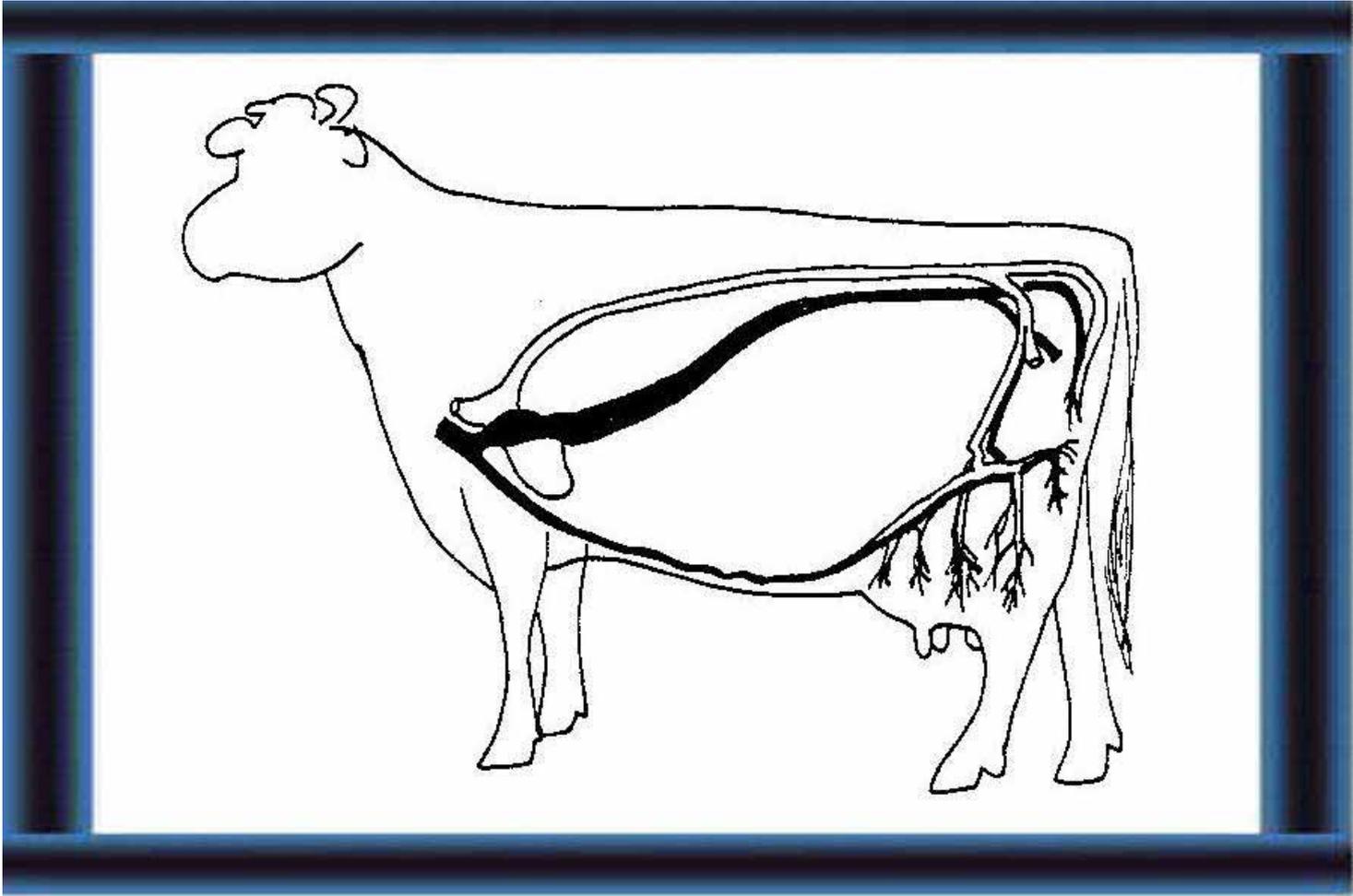
# **Small-Scale Dairy Farming Manual**

**Volume 4**

Husbandry Unit 7.1

## **PHYSIOLOGY OF MILK PRODUCTION**

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## Extension Materials

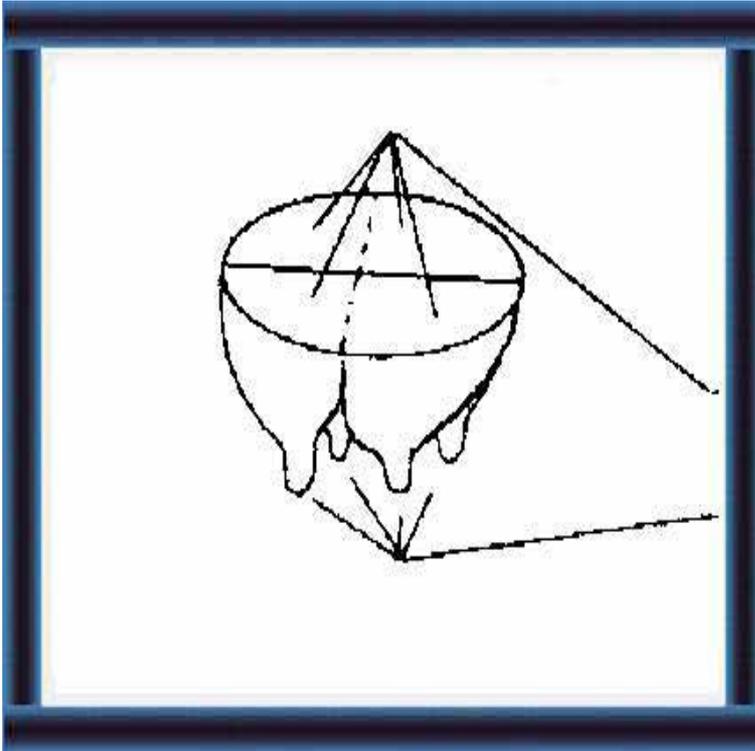
What should you know about the physiology of milk production?

Why is knowing about the



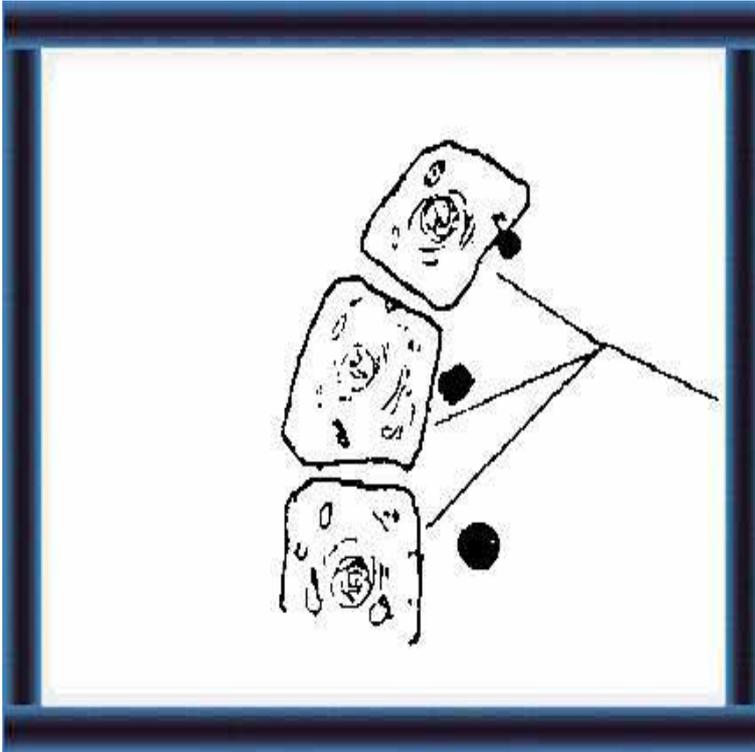
**physiology of milk  
production important? (5-8)**

- 1 So you can **improve** your:
- feeding
  - management.



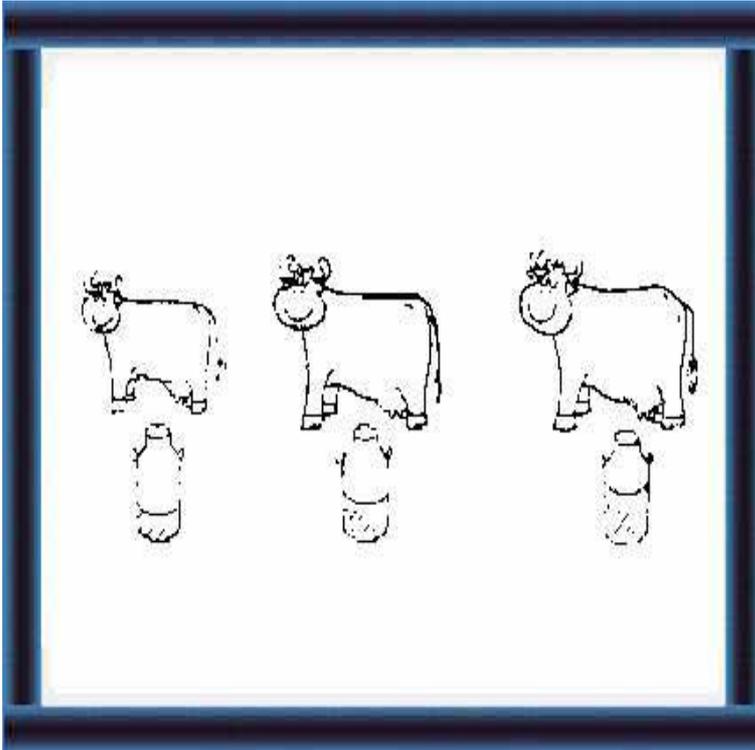
**What is your cow's udder  
like? (9-41)**

- 2 The udder is a **skin gland**  
with **four quarters** and **teats**.



**Where does your milk come from?(42-46)**

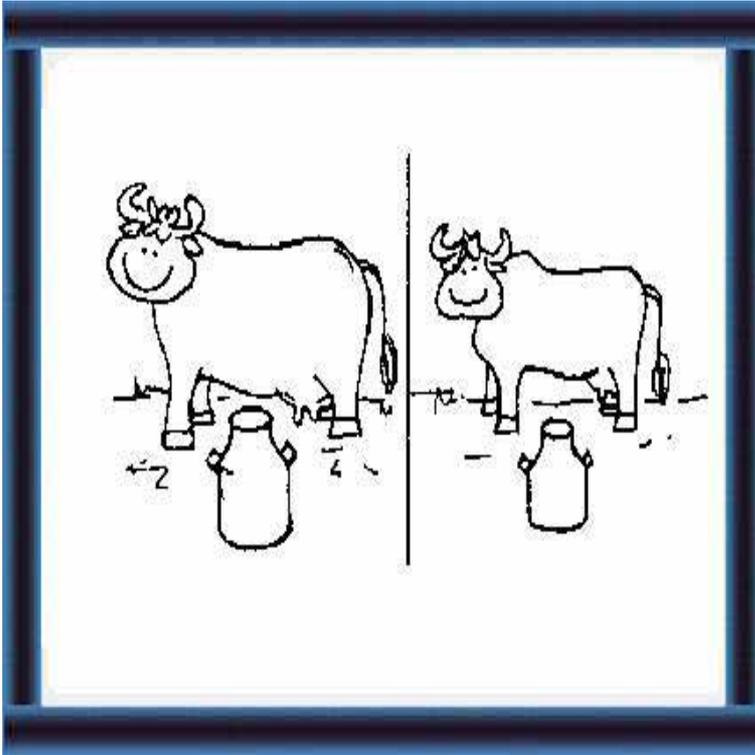
**3 Cells in the udder take nutrients from the blood and produce milk substances.**



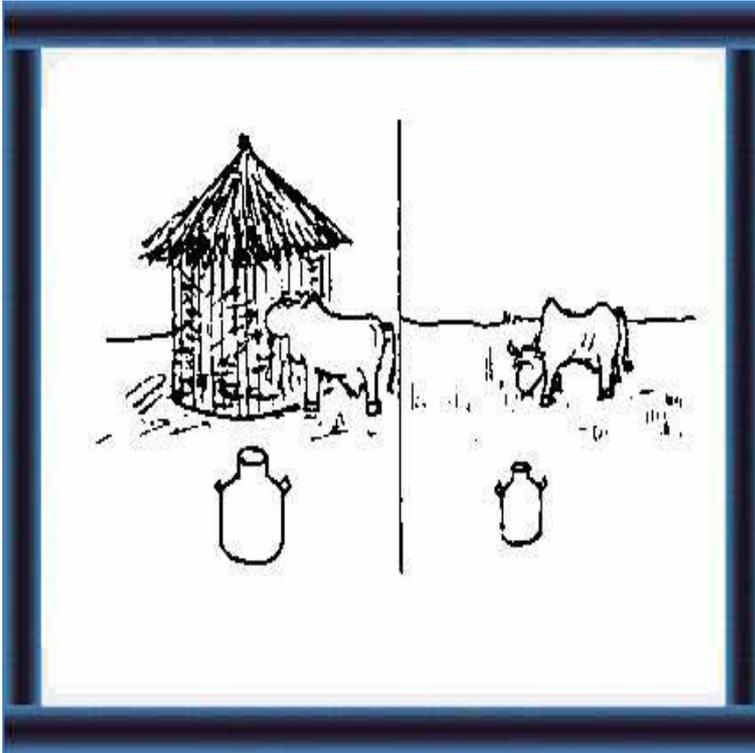
**What affects milk production? (47-60)**

**4 Many factors in:**  
- breeding  
- feeding  
- husbandry.

**Why is knowing about the physiology of milk production important?**



5 Breeding affects milk production



6 but so do your feeding and management.

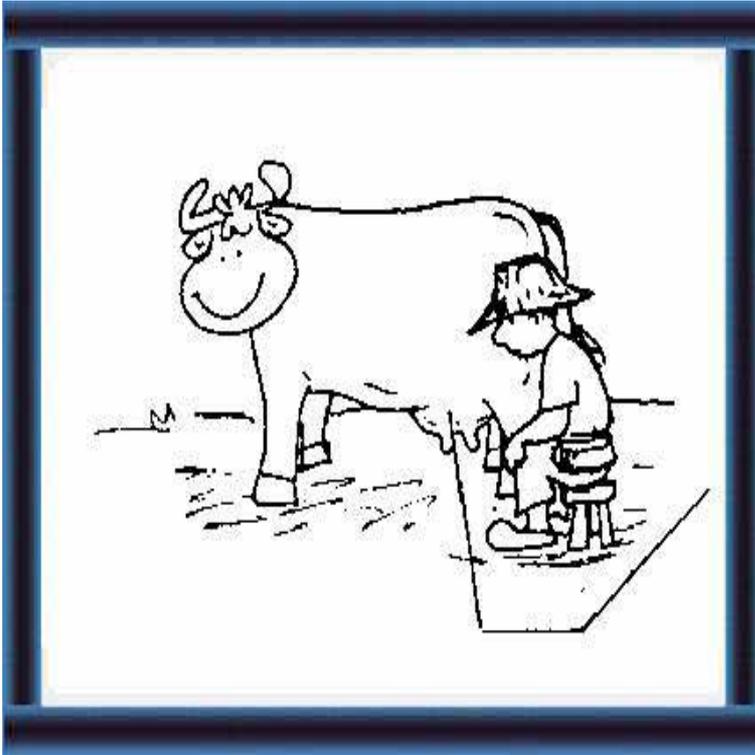


**7 Knowing about the physiology of milk production helps you to improve your feeding and management**

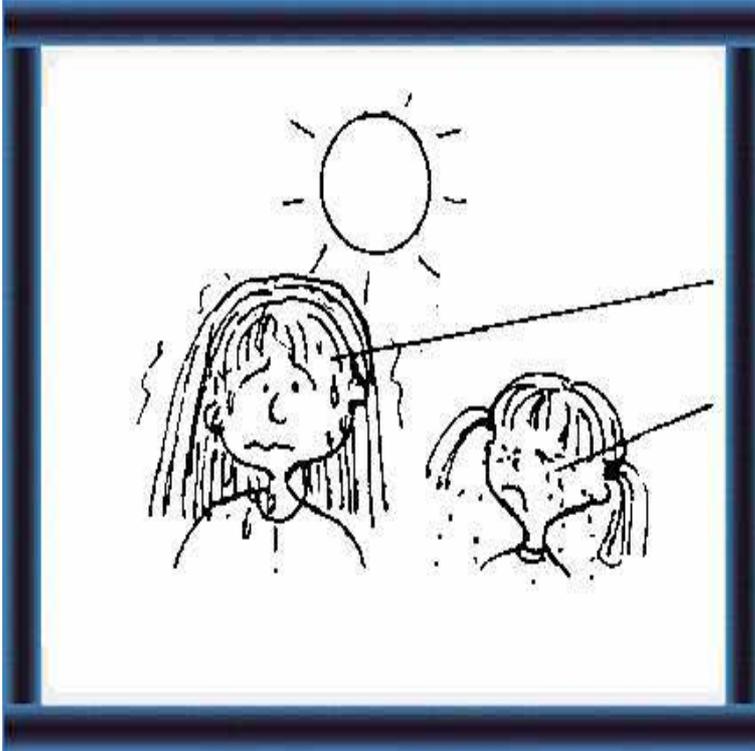


**8 and to produce more high quality milk and increase your income.**

**What is the udder?**



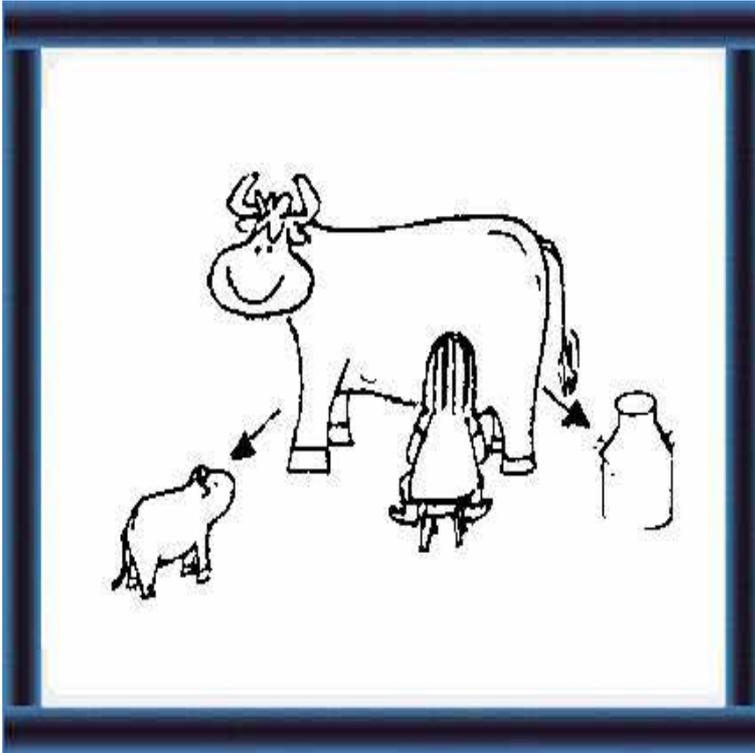
9 The udder is a well developed **skin gland**.



10 It is like sweat glands and tear glands which also **secrete fluids** to the outside of the body (exogenous glands).



11 All female mammals have an udder for **feeding** their **young**



12 and your cow's long lactation period gives **milk for you** as well as **her calf**.

What is the cow's udder like?

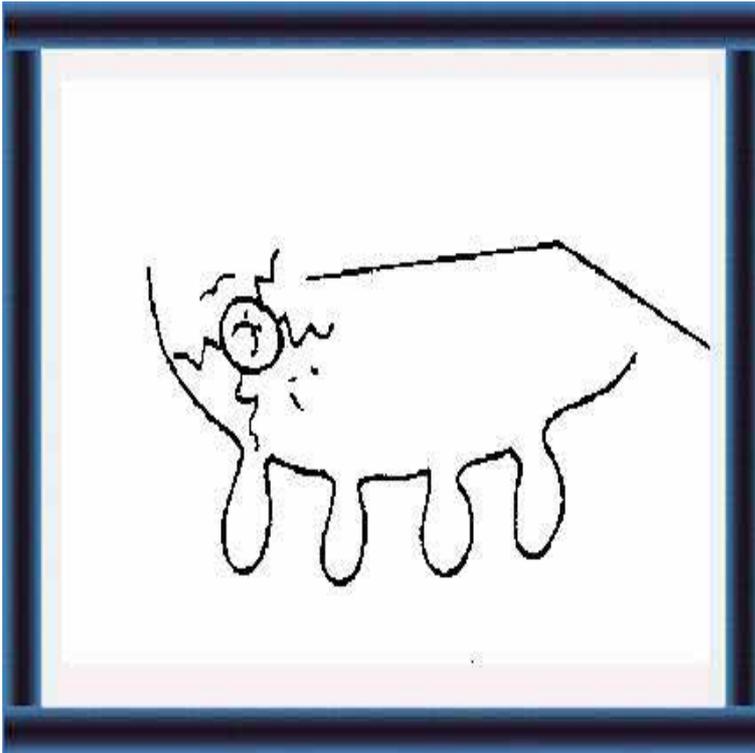


### Outside the udder

13 The udder **weighs** between **10-30 kg** without milk.

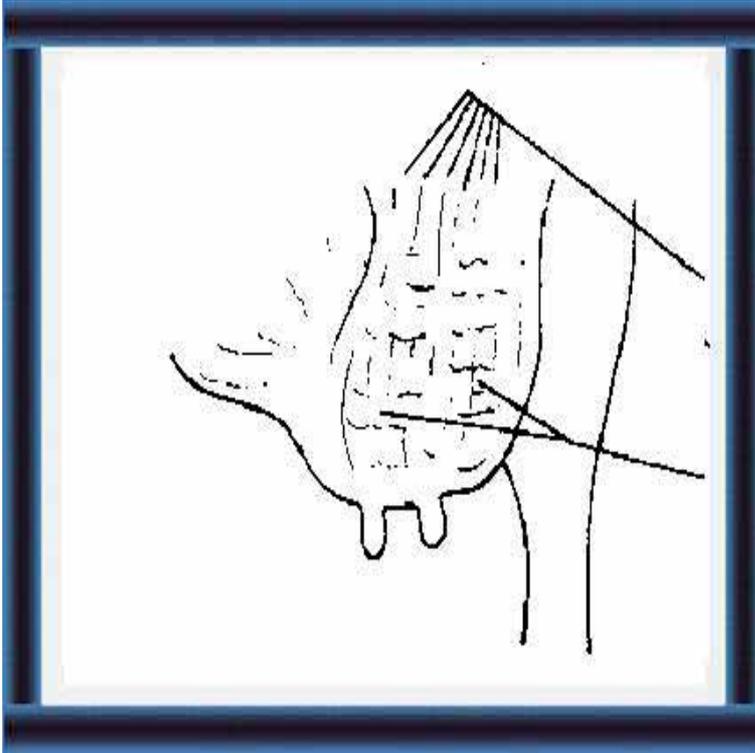
Signs of a good udder are:

- **level**
- left and right sides **similar size**.



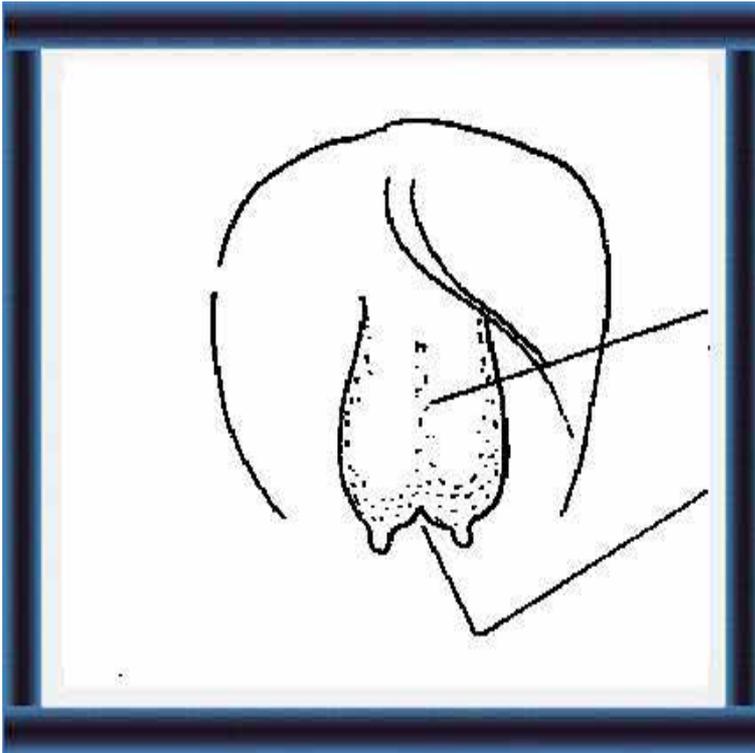
14 The **skin covers** the udder and **protects** it from rubbing and from bacteria.

But it is **not strong enough to support** the udder.



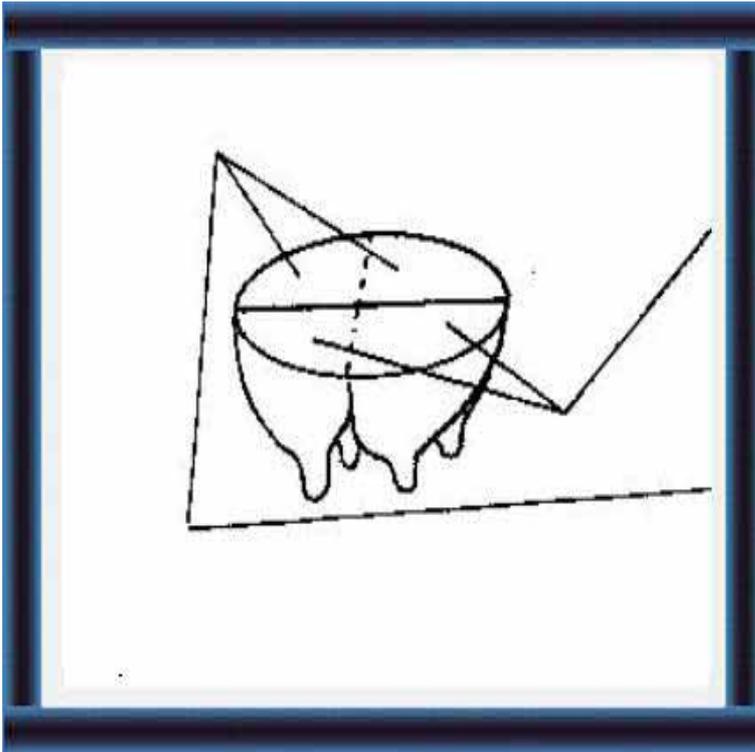
15 Strong tissues called **ligaments** help to **suspend the udder**.

Two bands run along each side of the udder.



16 One band runs down the middle of the udder between the right and left halves.

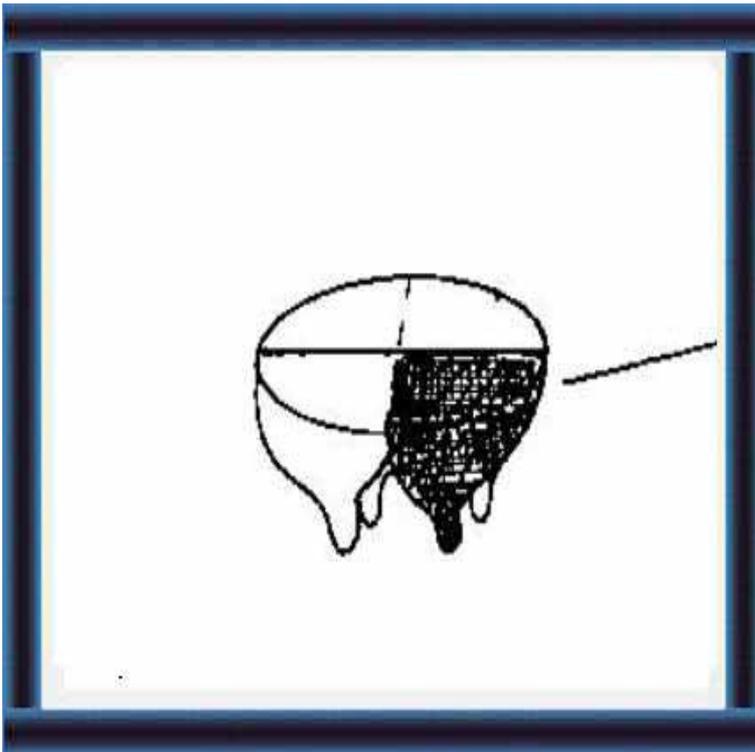
The middle ligament meets the two side ligaments at the bottom, making a **strong sling**.



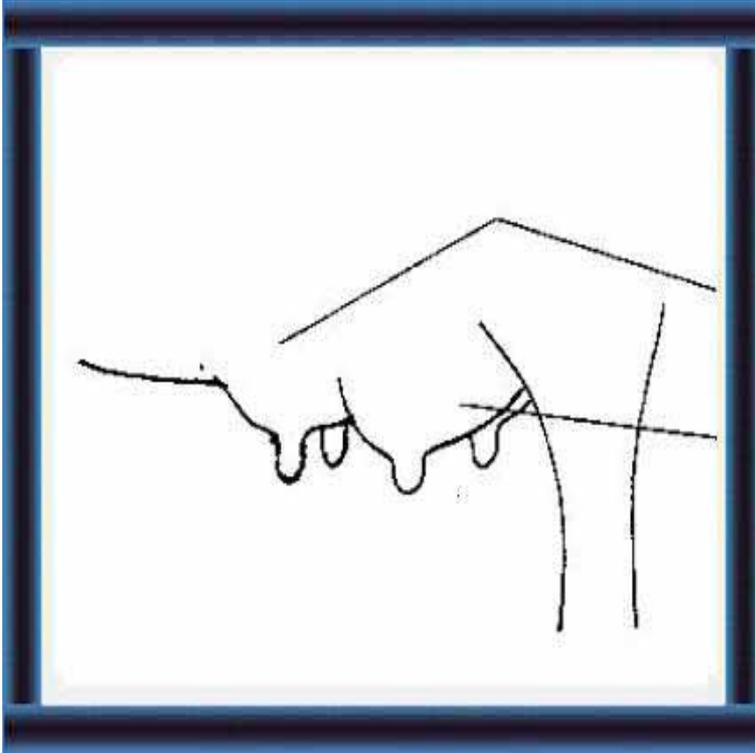
17 The udder has **4 quarters** and

the two quarters on the left are **clearly divided**

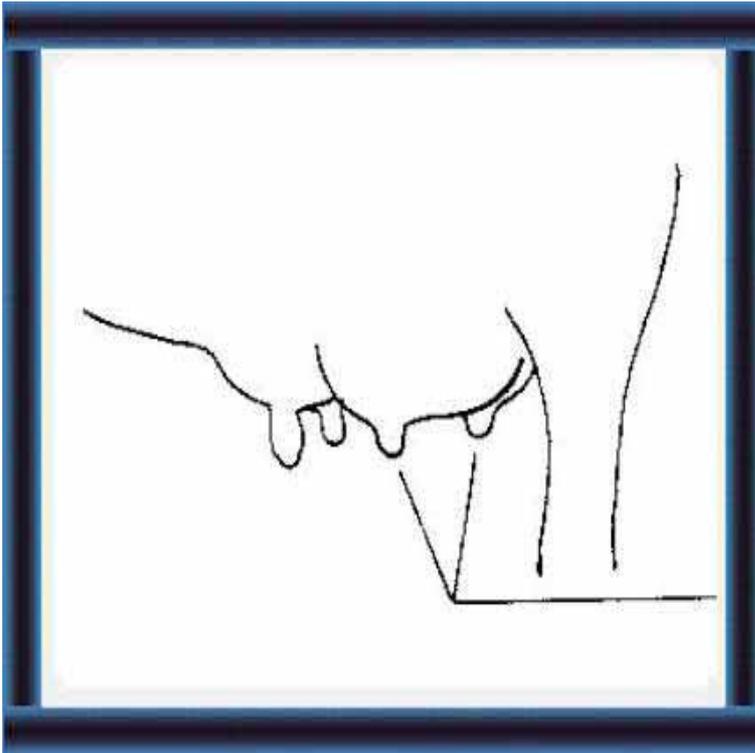
from the two quarters on the right.



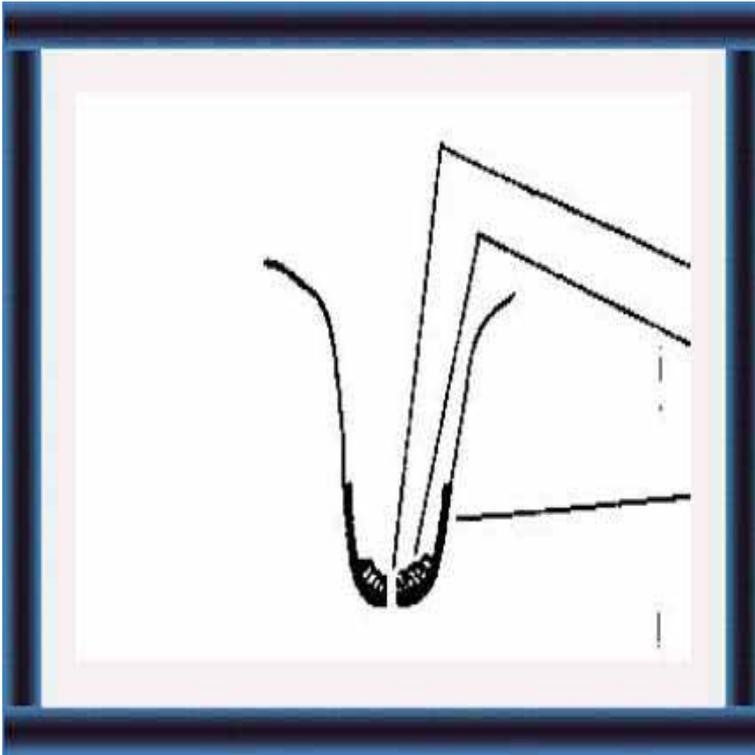
18 It is possible for a cow to have **disease in one quarter** without affecting the other quarters.



19 The front and rear quarters of the udder are not clearly separated.  
The **rear quarters are larger** and produce about **60%** of the milk.



20 Each quarter usually has one teat and the rear teats are usually shorter than the fore teats.



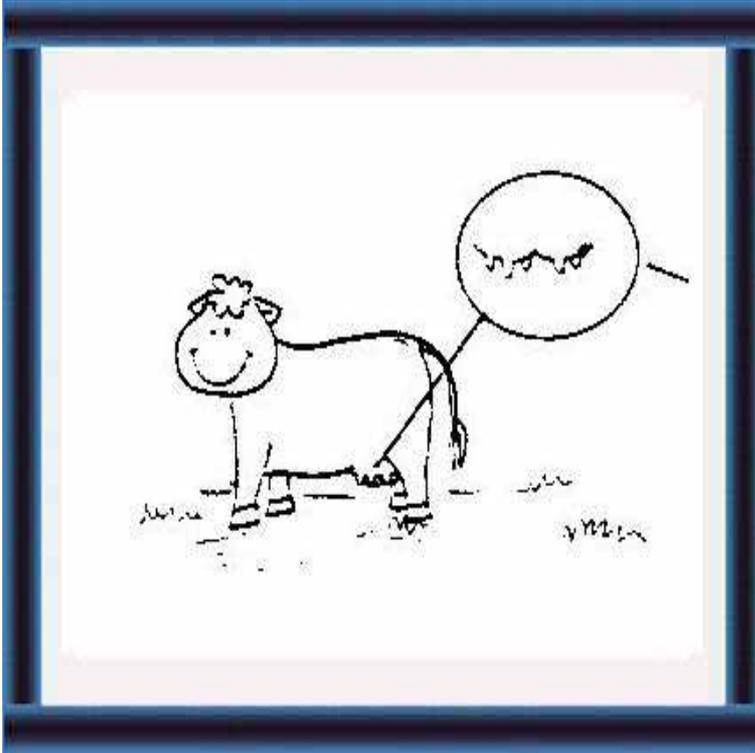
21 The teat has:

- an **opening** for milk to come out
- a **muscle** to close the opening
- a **lining** to protect against bacteria.



22 Signs of good teats are:

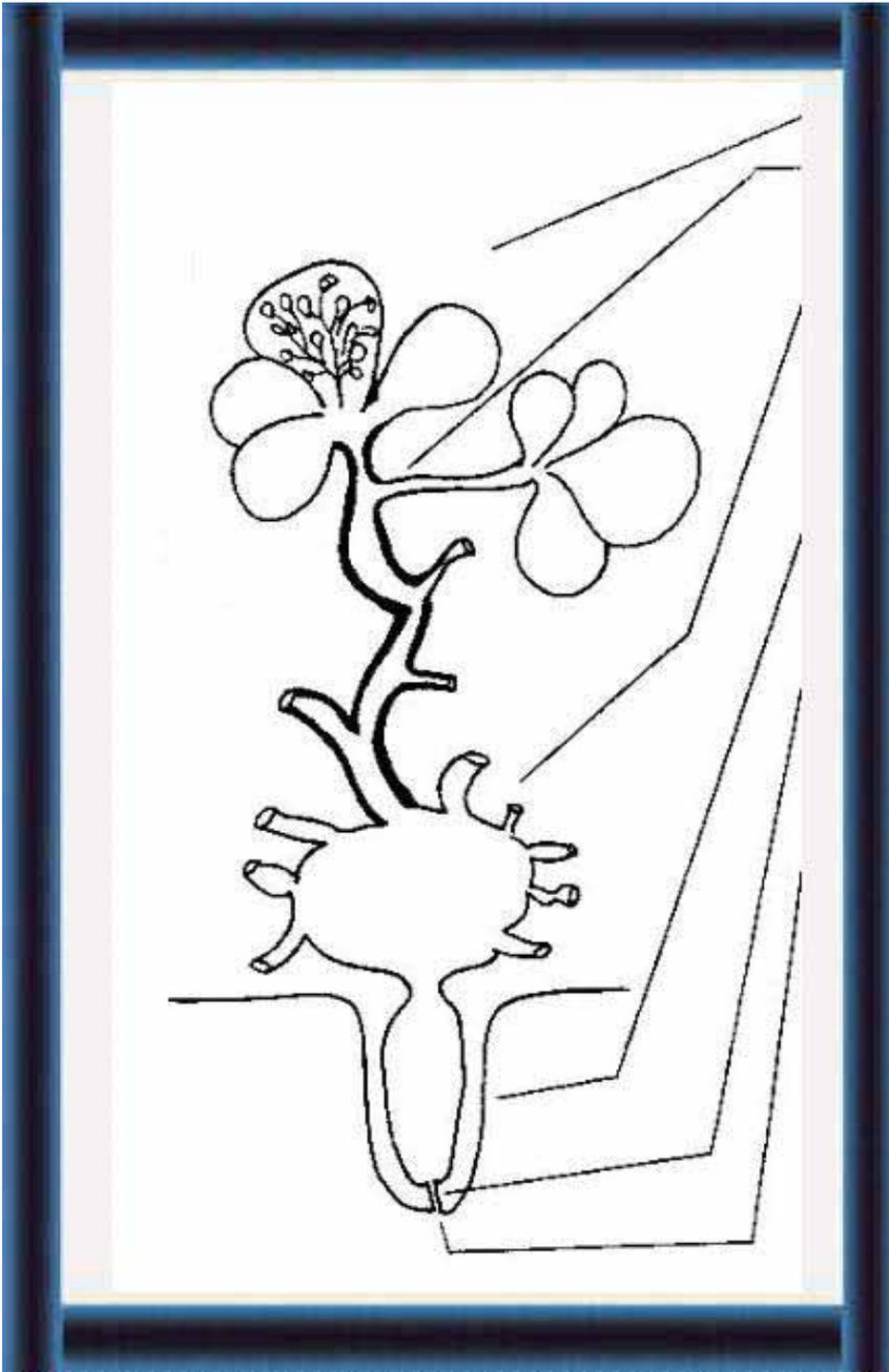
- **moderate size**
- **good position** in quarter
- **good muscle tension** to stop leaks but allow easy milking.



23 Consult your extension worker about calves with more than 4 teats. Removal of extra teats helps protect against mastitis.

### **Inside the udder**

24 Inside the udder you can see **lobes** which produce milk. The milk from each lobe passes through large **ducts** to the **gland cistern** which can store about  $\frac{1}{2}$  l milk.

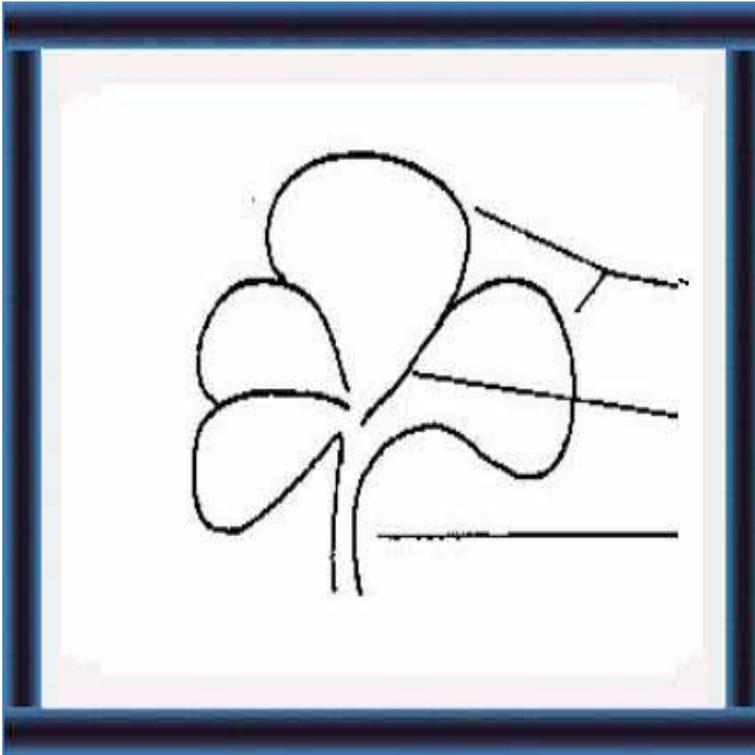


**Folds** in the tissue help to keep the milk in the gland cistern until the cow is suckled or milked.

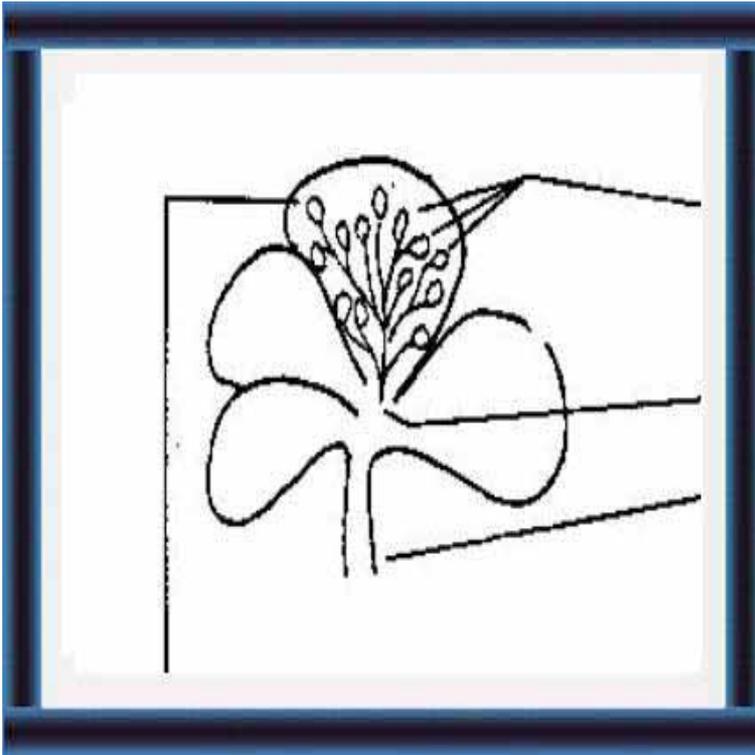
The **teat** is hollow and can hold a small amount of milk.

The **streak canal** (about 1 cm long) is at the end of the teat and leads to the **outer opening**.

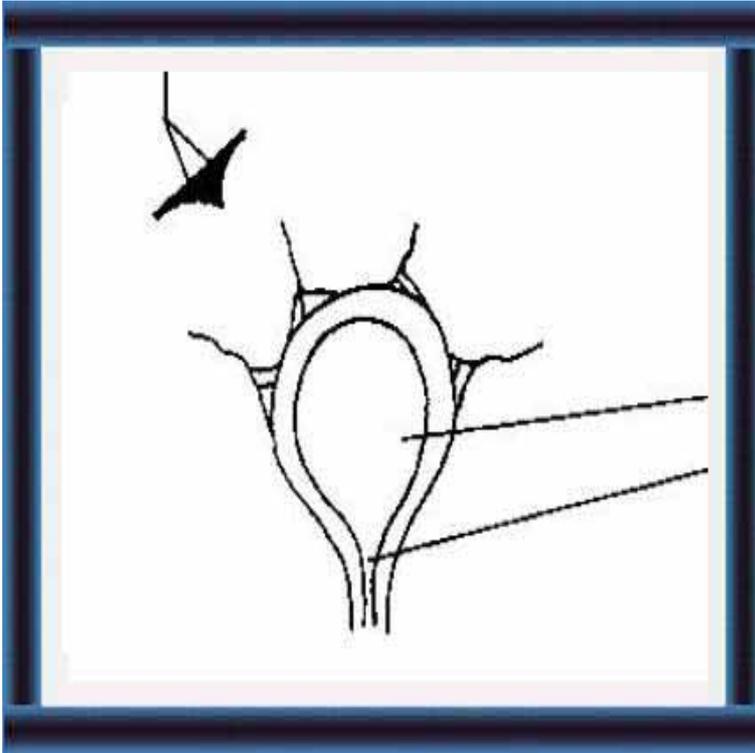
The canal is involuntarily closed between milkings.



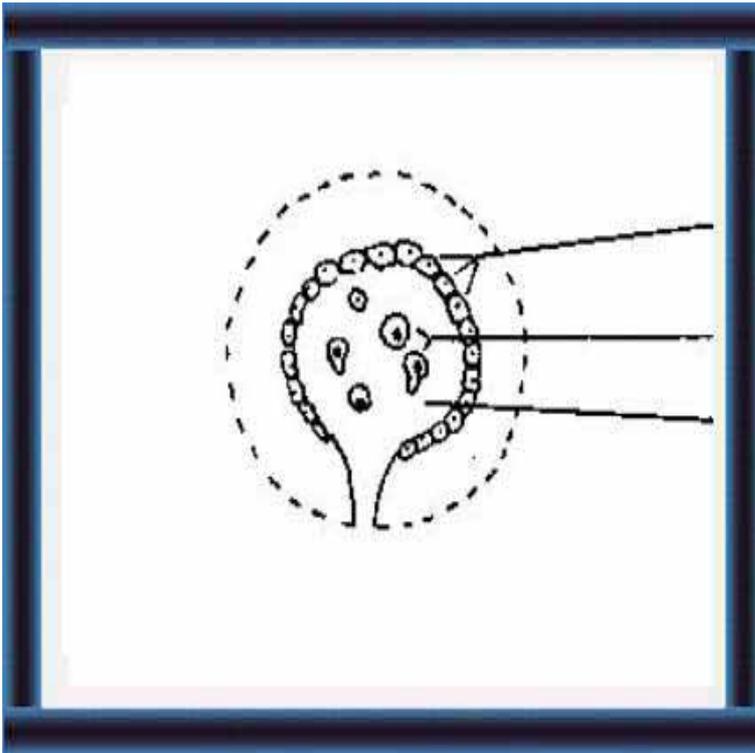
25 Each **lobe** has a number of **lobules** and one large **duct** which drains the milk. **Connective tissue** separates the lobules.



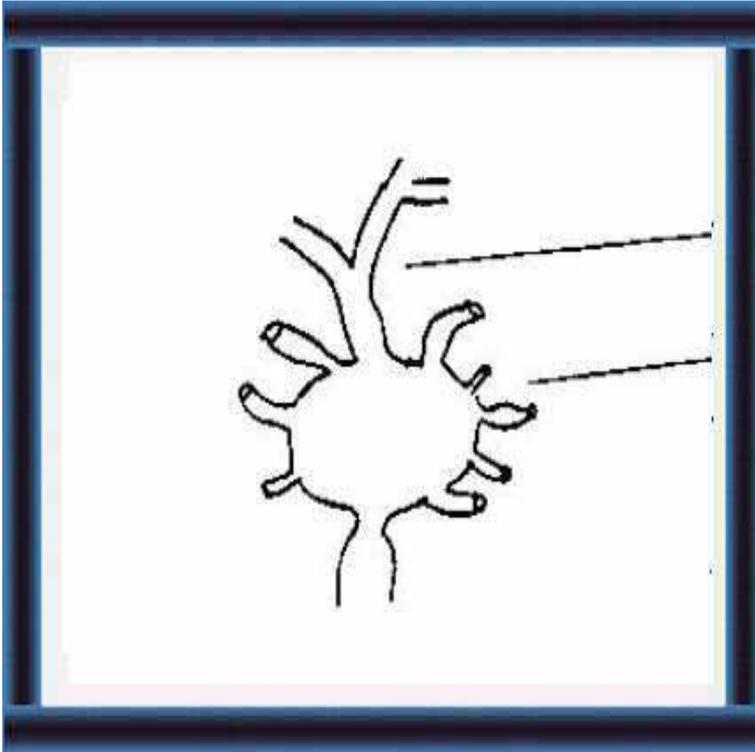
26 Each **lobule** has many **alveoli** and a duct which drains the milk from the lobule into the **lobe duct**.



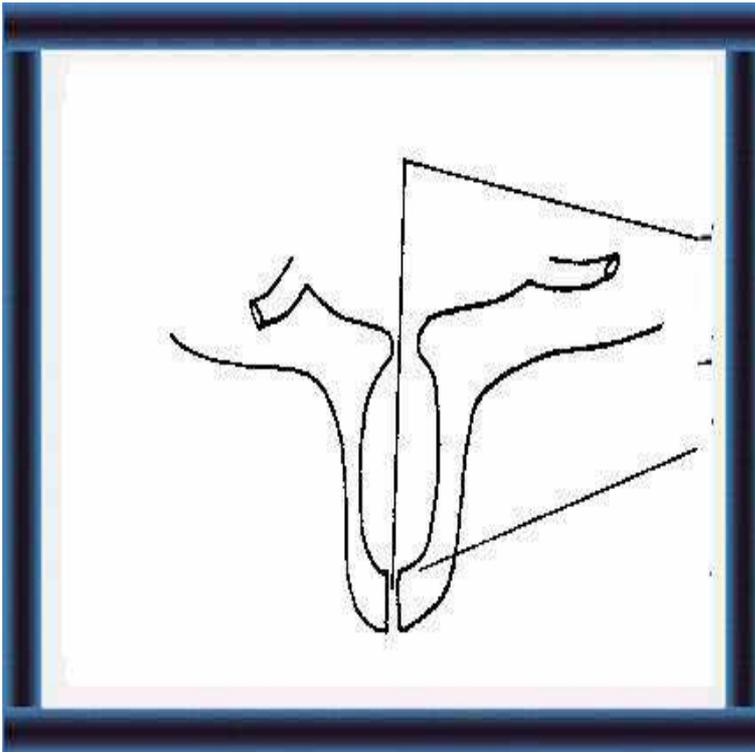
27 Through a microscope, you can see that each **alveolus** has a small **duct** which drains milk into the **lobule duct**.



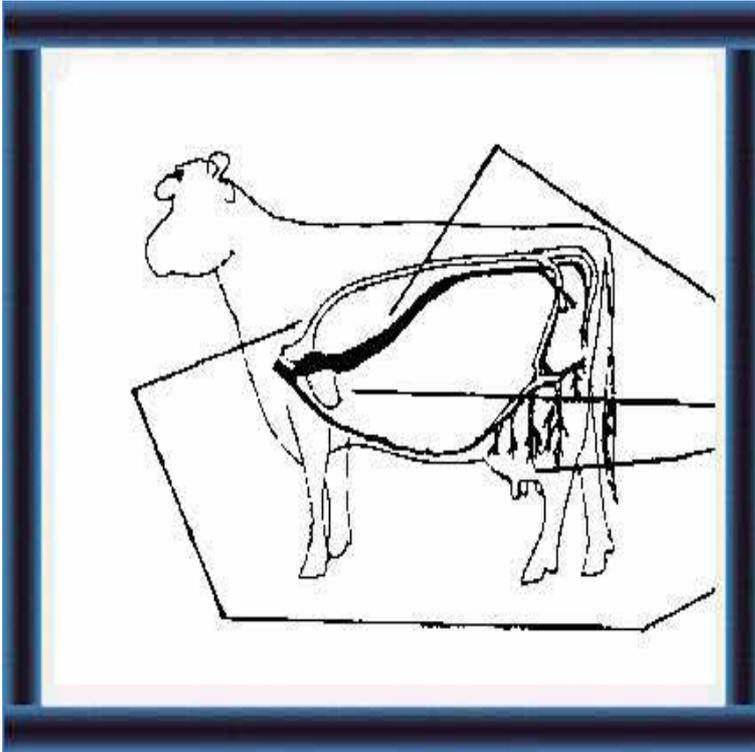
28 The **alveolus** is like a small sac.  
The cells on the wall secrete particles of **milk fat** covered in protein into the **hollow centre** of the alveolus.



29 The **mammary ducts** drain the milk from the **lobes** into the **gland cistern**. These ducts only store and drain milk.



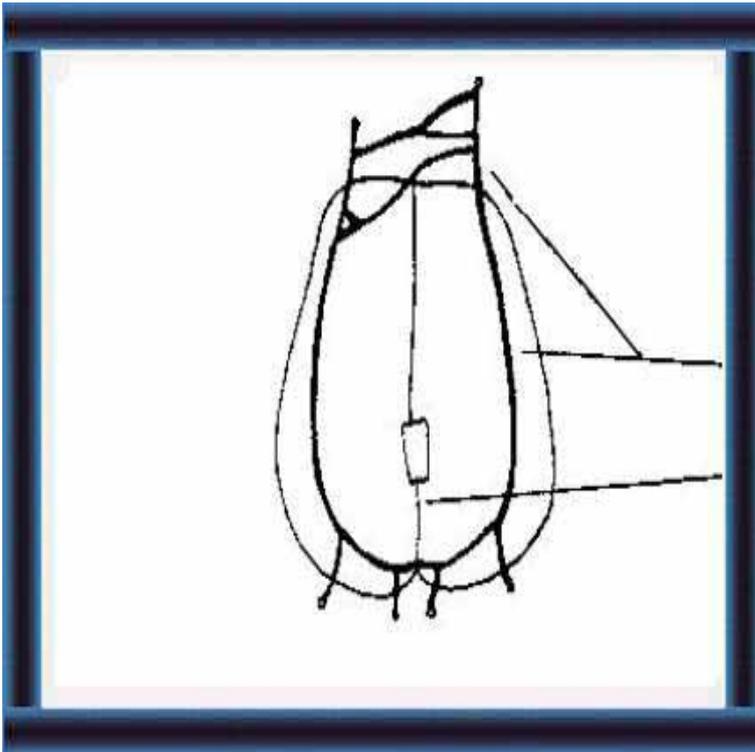
30 The **streak canal** secretes a liquid which fights bacteria. A **muscle** closes the streak canal. If the muscle is **loose**, milking is faster but it is easier for the cow to get udder infections.



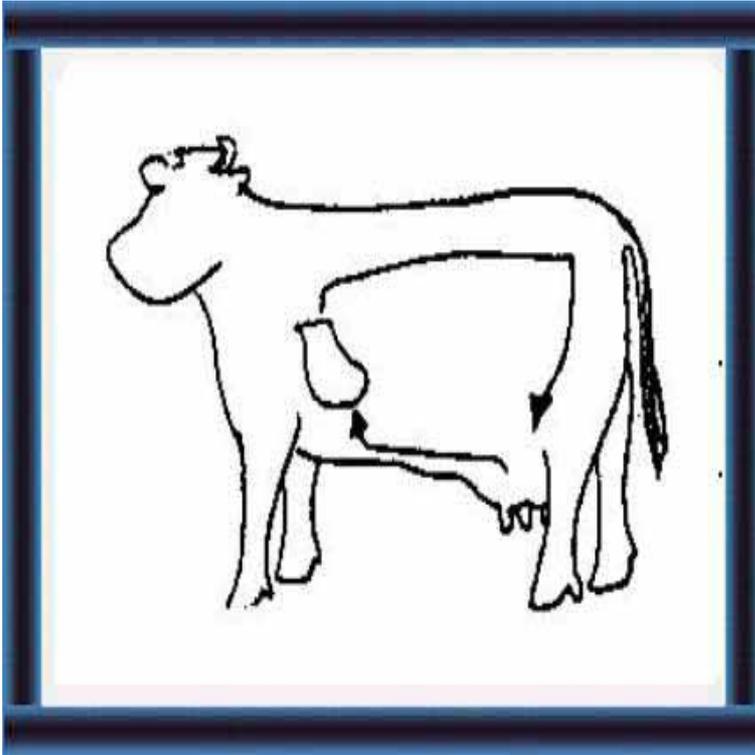
**The blood system**

31 **Arteries** carry blood from the **heart** to the **udder** and carry **food** and **oxygen**.

**Veins** carry blood with **waste products** away from the udder.

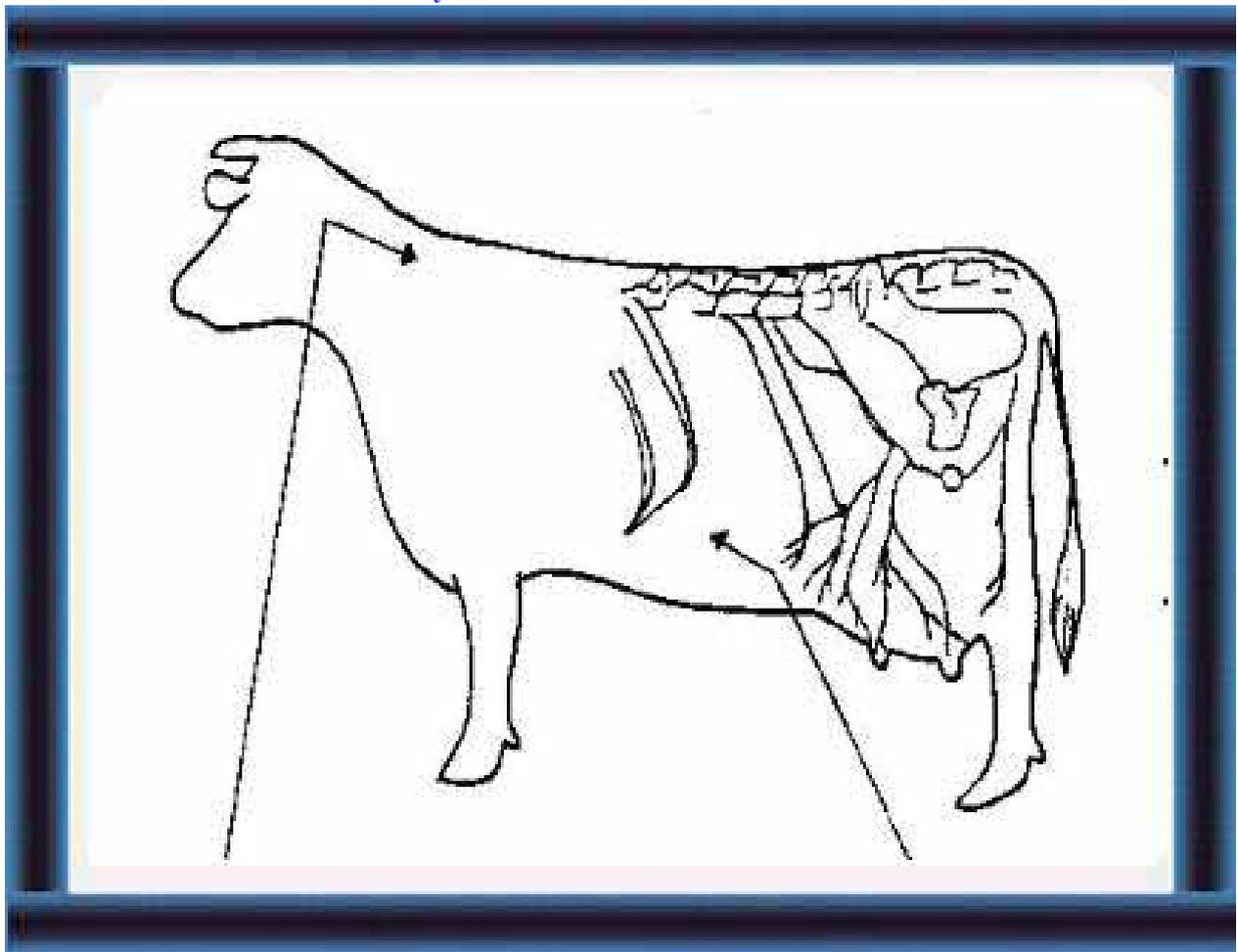


32 Looking from the back, you can see the **milk veins** and other veins and the **middle ligament**.



33 **Blood flow** is important for milk production. About 500 l of blood must flow through the udder to produce 1 l of milk.

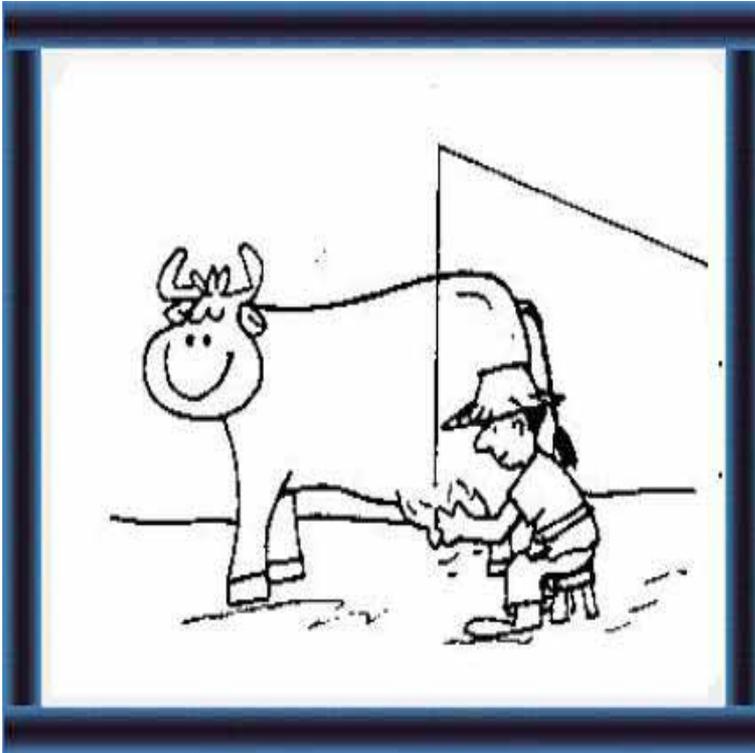
#### 34 **The nerve and the endocrine system**



Some nerves send messages from the brain to the udder. This controls **blood flow** and **milk production**.

Other nerves send messages from the udder and other parts of the body to the brain about touch,

temperature and pain. The body then releases hormones which also control blood flow and milk production.

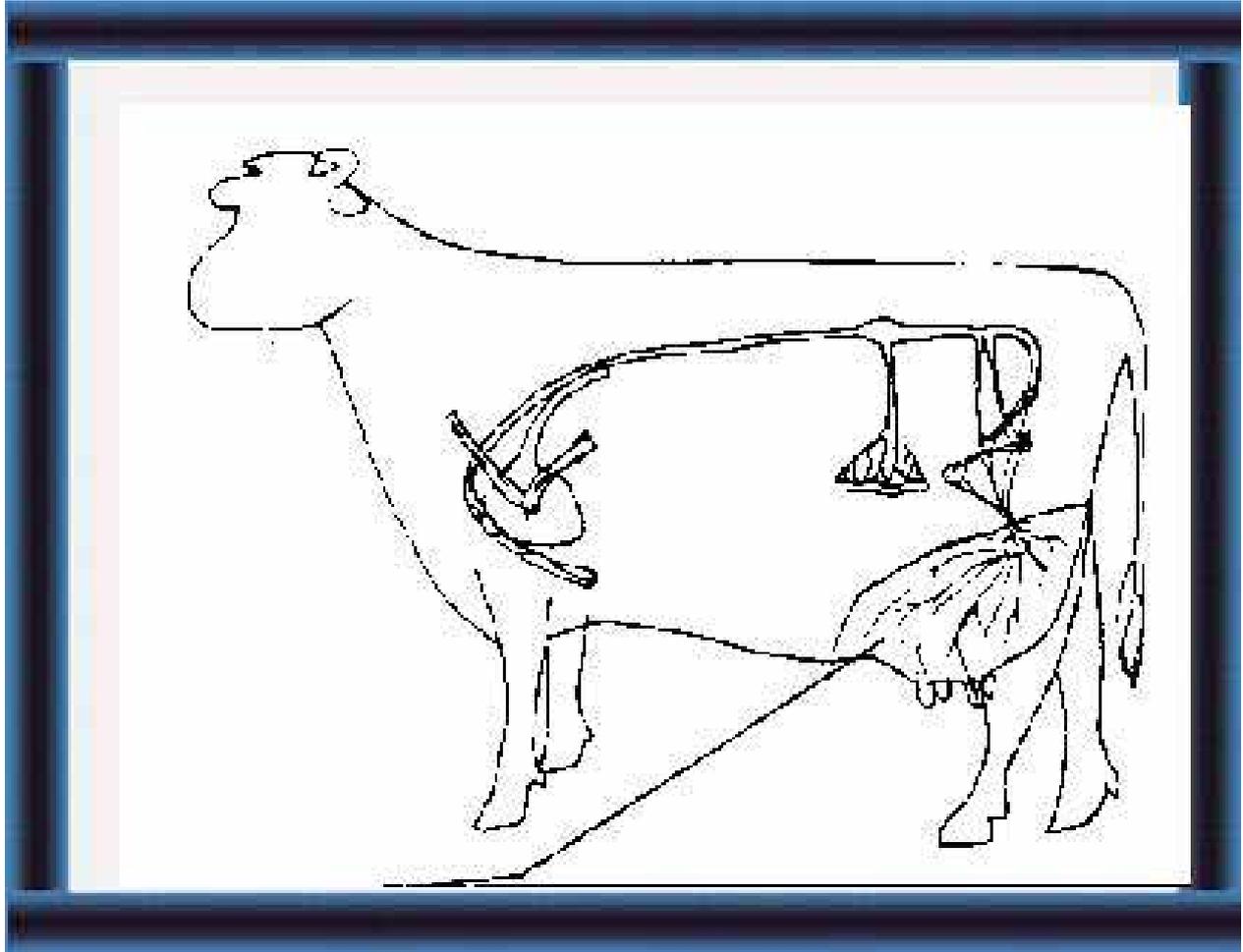


35 **Touching** and **washing** the udder sends a message to the brain and glands release a hormone **oxytocin** into the blood. This helps **milk let-down**.



36 Excitement and pain also send messages to the brain. Glands release another hormone **epinephrine** which **reduces** blood flow and milk production.

### 37 The Lymph System



Lymph ducts drain colourless fluid from tissues into the blood vessels.

page 99

38 You can feel some of the



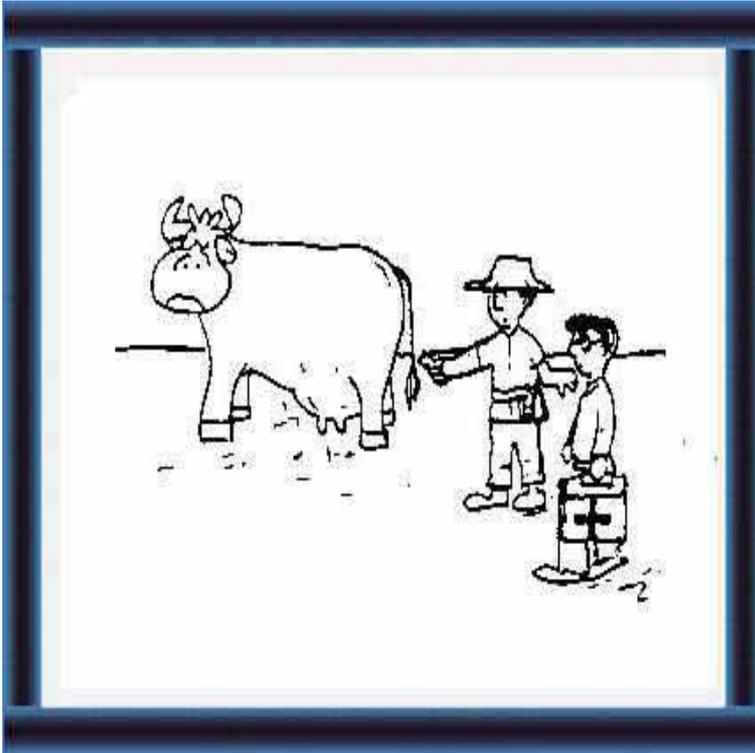
lymph nodes through the skin. They are part of the **cow's immune** system and help **fight disease**.



39 Near parturition, the lymph ducts **cannot drain enough** fluid from the udder which swells more than normal. This is called **udder edema**.

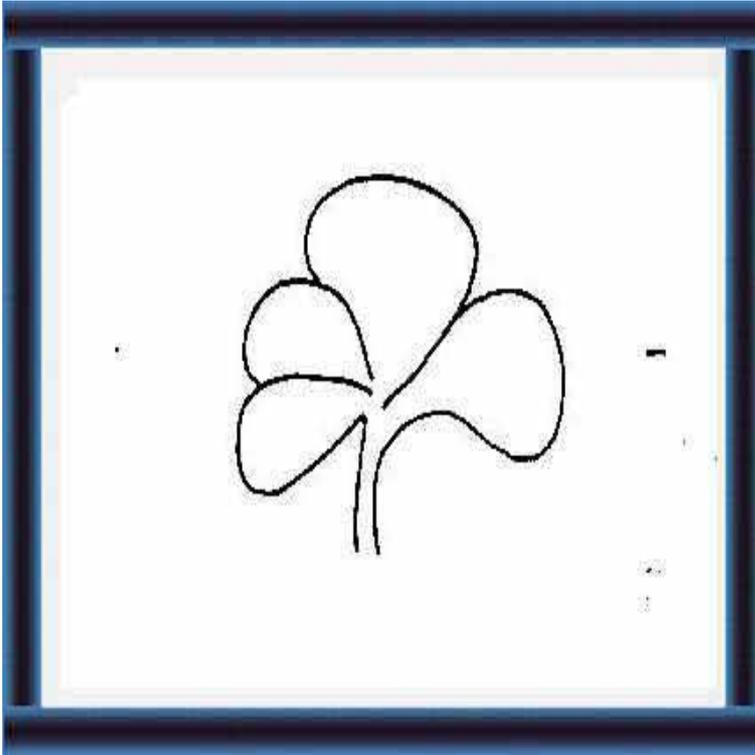


40 Milking does **not help** because the fluid is between the cells and not in the milk ducts.

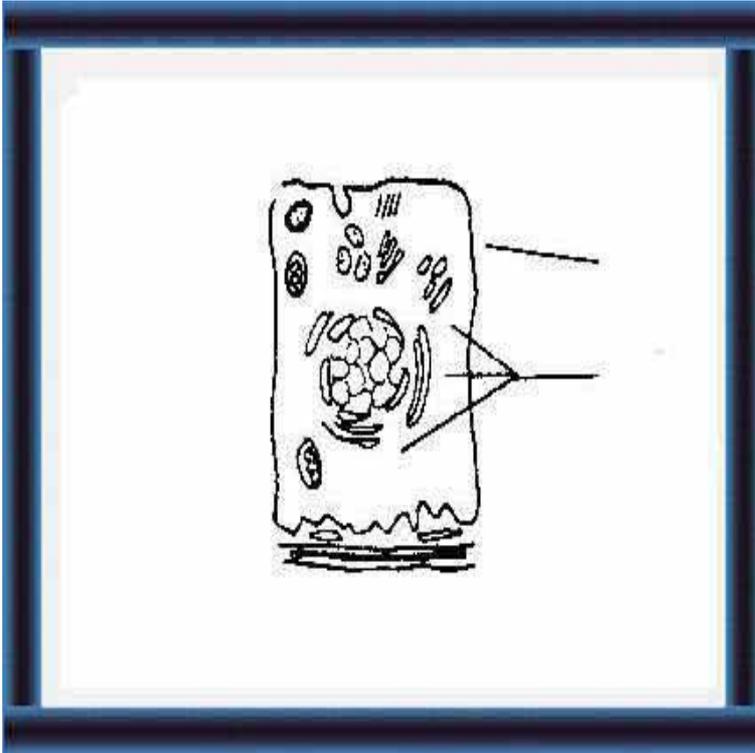


41 **Reducing salt intake** may help because salt keeps water in the cow's body. If the swelling is bad, **call your vet** who can give drugs.

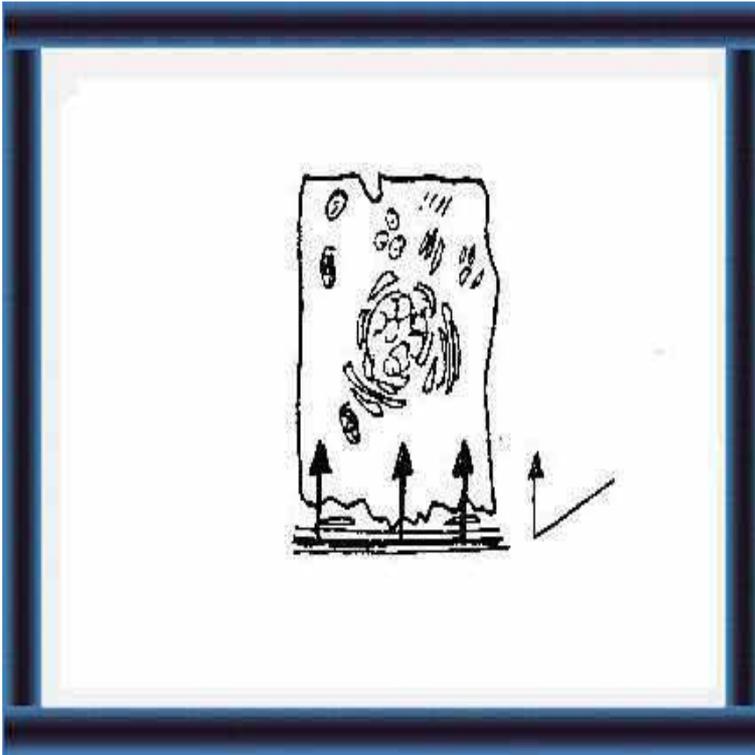
How does your cow produce milk?



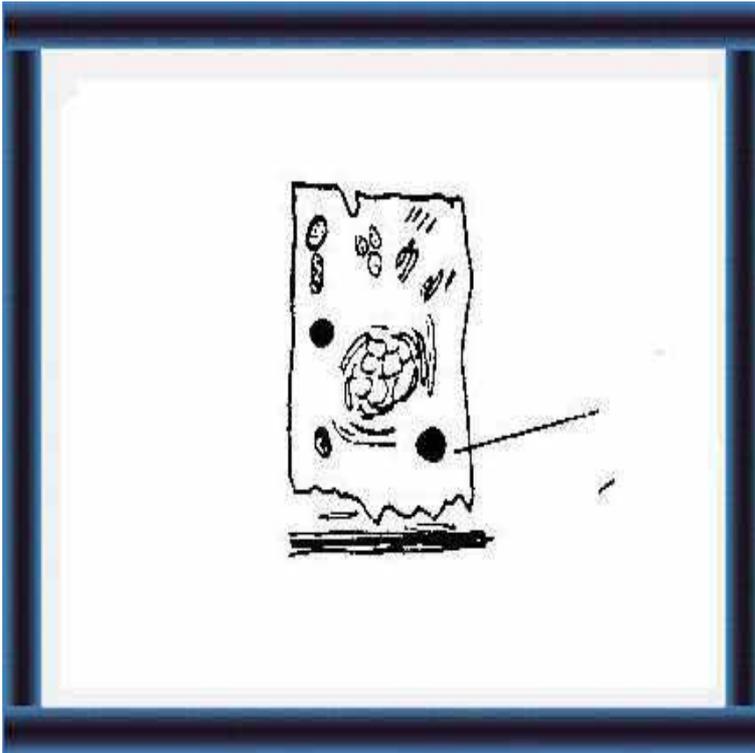
42 Each **alveolus** has cells which produce the substances in milk e.g. sugar, fat and protein.



43 Each cell in the alveolus has many structures inside it. To produce milk the cell:

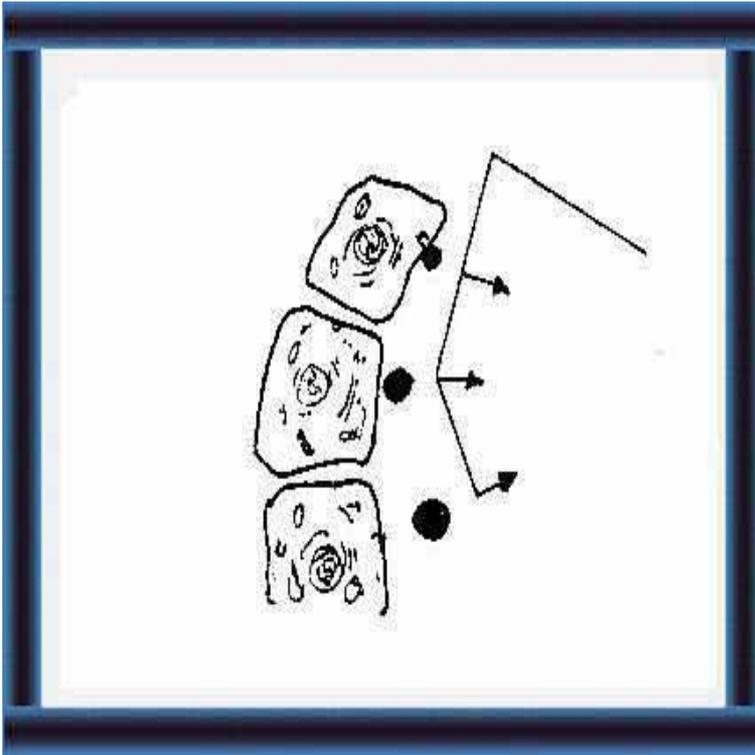


44  
-takes **nutrients** from the  
blood



45  
-produces the **milk**  
**substances** inside the cell

What affects milk production?



46

-releases milk substances into the alveolus where they mix with water to form milk.



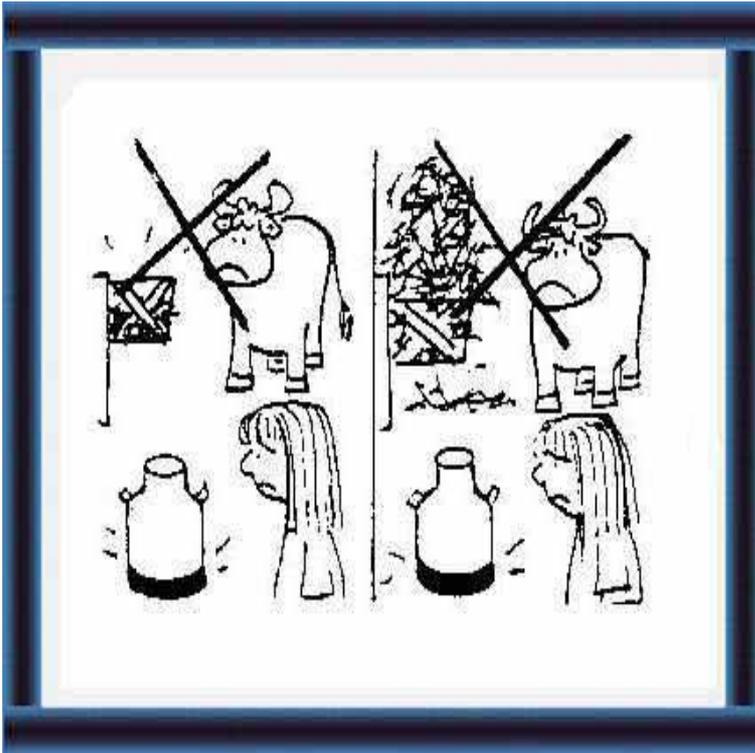
### Heredity

47 Different breeds and different cows can produce different amounts of milk.

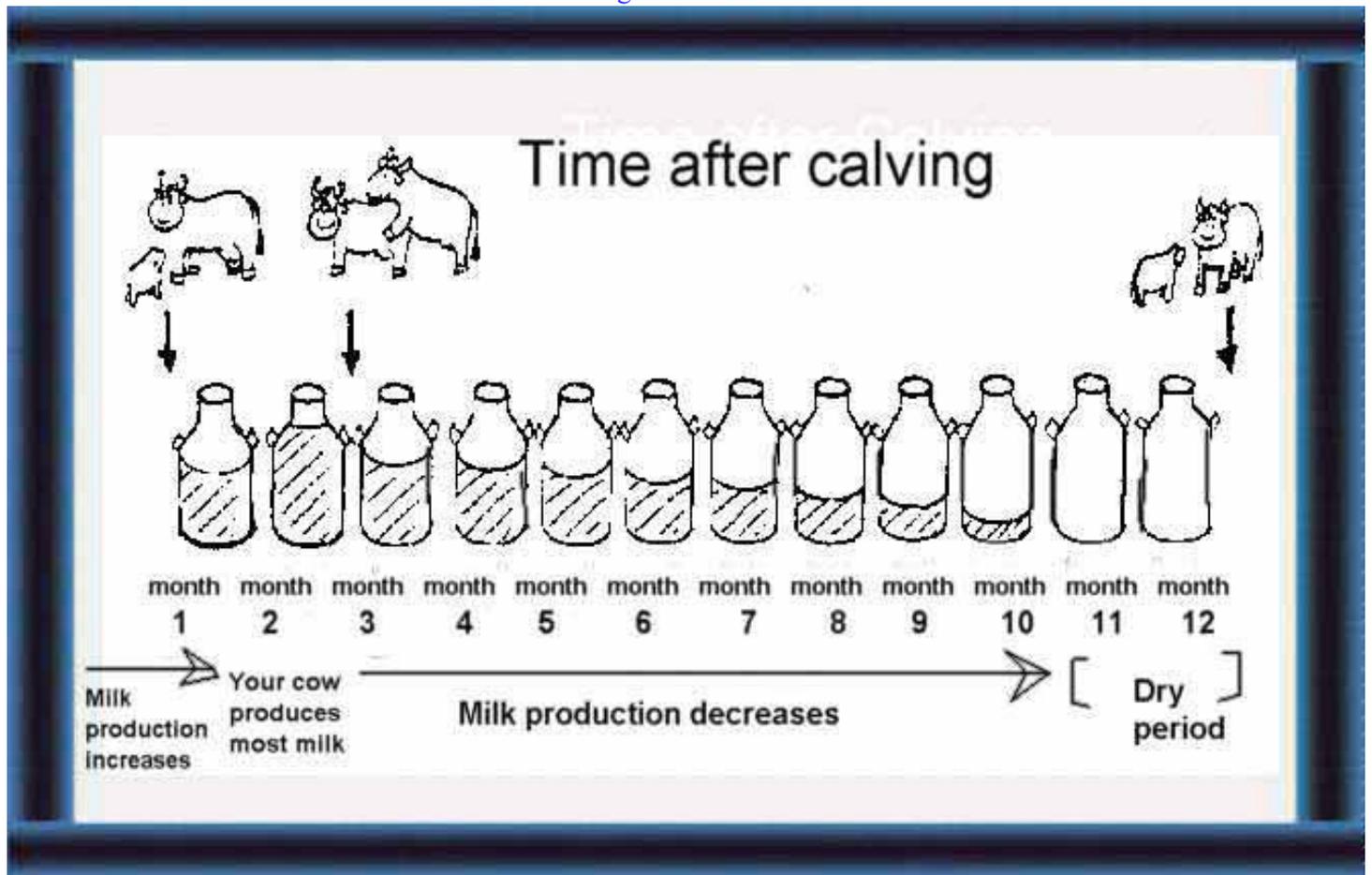


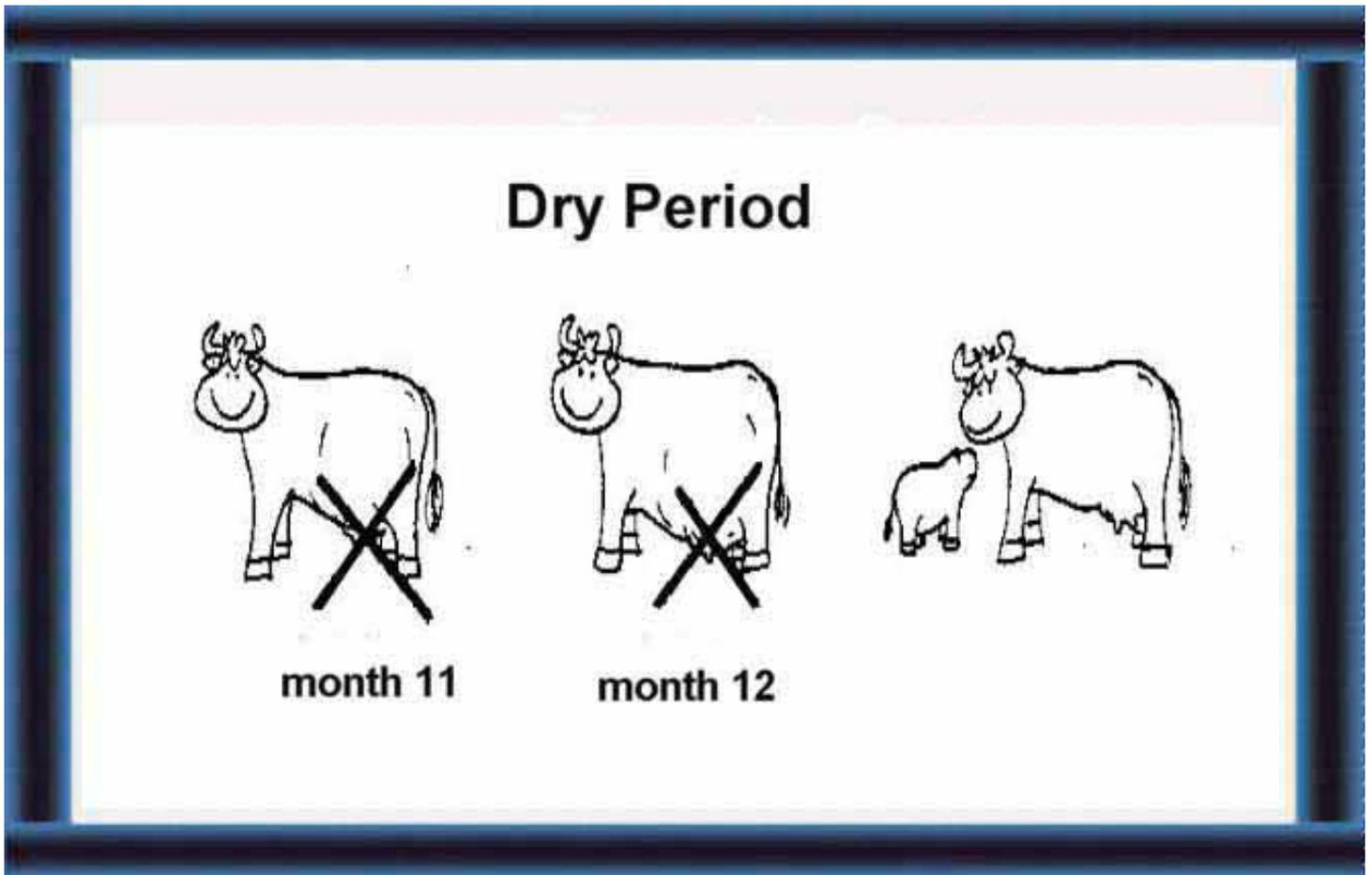
### Nutrition

48 Your cow needs the **right amounts** of feed, roughage and concentrates for **maintenance and production rations**.



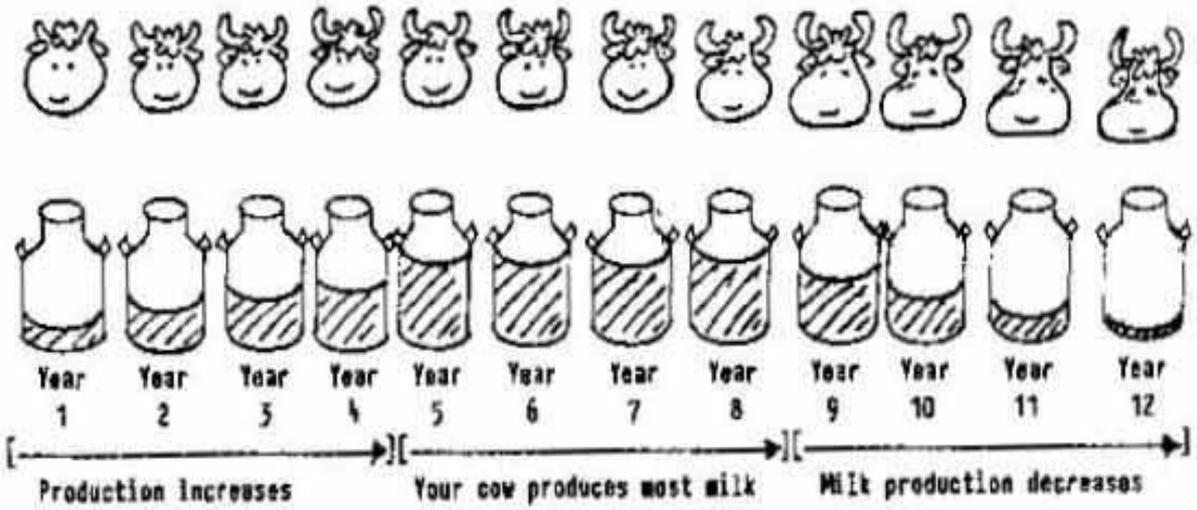
49 **Under feeding and over feeding** lead to **poor milk production**.



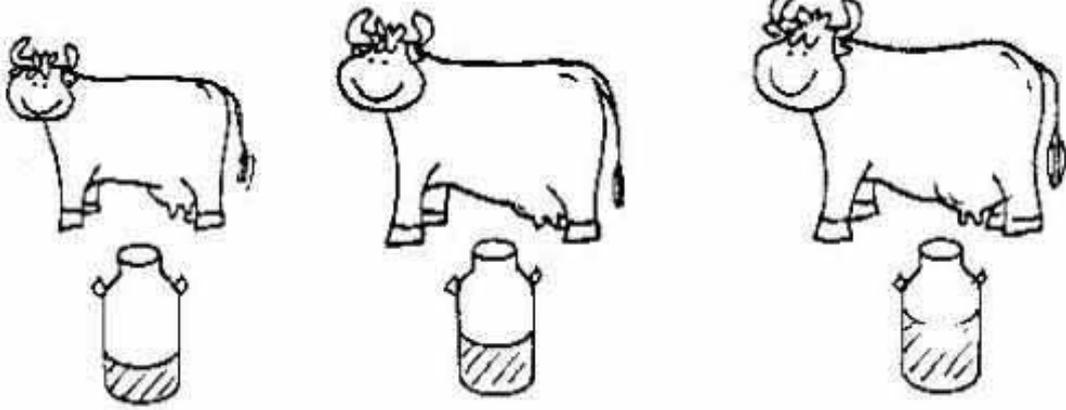


If you dry off your cow for 8 weeks before calving, your cow will produce more milk after calving. If the dry period is too long or too short, your cow will produce less milk.

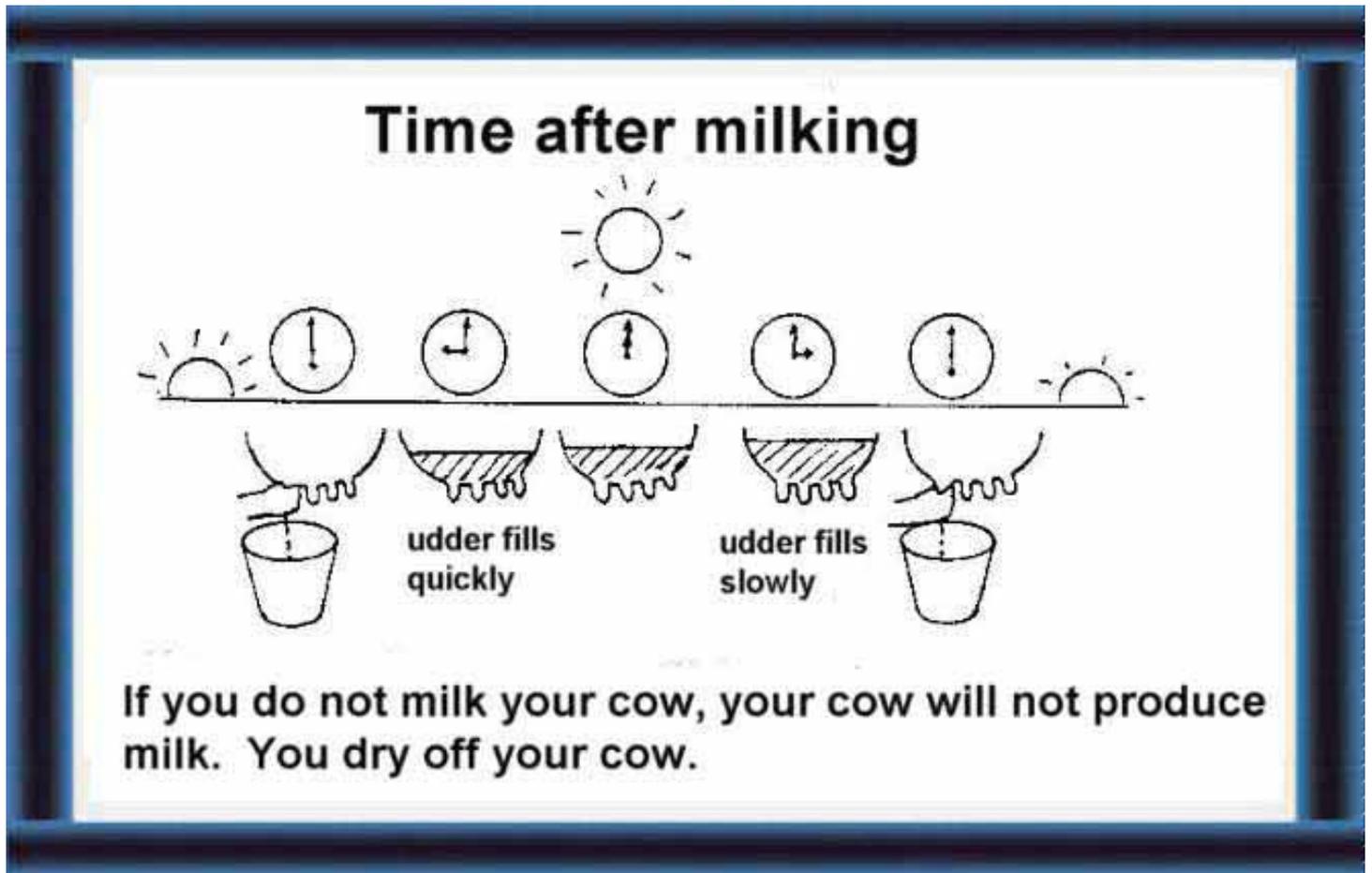
# Age



## Body size

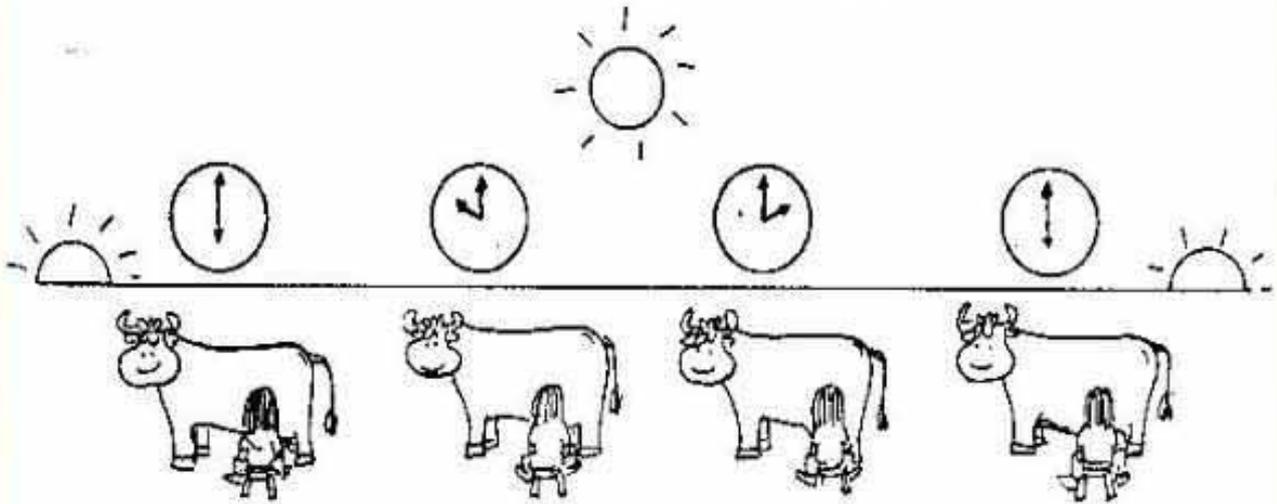


**Bigger cows usually produce more milk**



If you do not milk your cow, your cow will not produce milk. You dry off your cow.

Number of milkings



You can milk your cow 3 or 4 times a day. You get a little more milk but:

- you have to give more feed;
- you have to do more work.

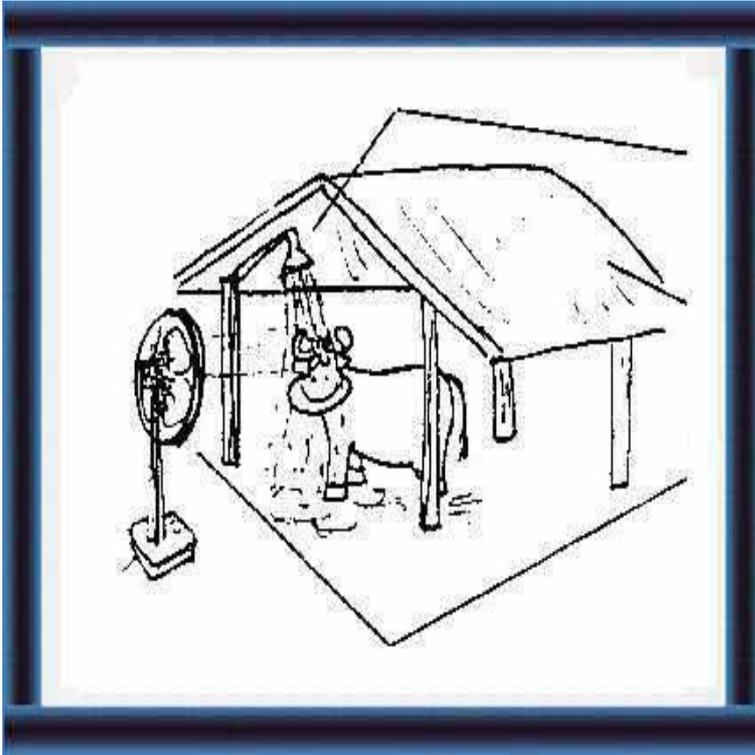
You can milk your cow 3 or 4 times a day. You get a little more milk but:

- you have to give more feed
- you have to do more work.



Temperature

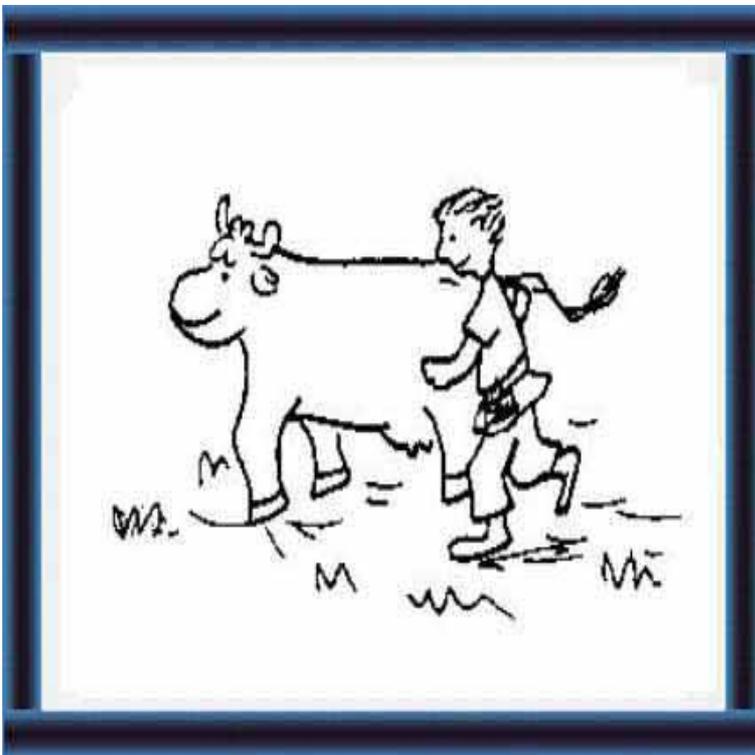
56 If your cow is hot, she will eat less and produce less milk.



**57 Keep your cow cool with:**  
- insulated roof  
- shade  
- fan or breeze  
- shower.

page 105

**Exercise and calm**



**58 Gentle exercise helps  
milk production**



**59 but make sure your cow is quiet and calm around milking time.**



**Disease**

**60 If your cow has mastitis, milk fever or other disease, the quantity and the quality of your milk is lower.**

**Call your vet.**

**What do you know about the physiology of the udder?**

**Importance**

**Knowledge of physiology of the udder helps improve:**

**1 feeding and management (6-7)**

**2 milk production (8)**

**What the udder is**

**1 Skin gland (9-10)**

**2 Milk production (11-12)**

**What the udder is like**

**1 Exterior**

- weight and appearance (13)

- skin (14)

- supporting tissues (15-16)

- quarters (17-20)

- teats (21-23)

**2 Interior**

- gland cistern (24)

- lobes, lobules and alveoli (25-28)

- gland cistern and streak canal (29-30)

**3 Blood system (31-33)**

**4 Nerve system (34-36)**

**5 Lymph system (37-41)**

**Milk production (42-46)**

**Factors affecting milk production**

**1 Heredity (47)**

**2 Nutrition (48-49)**

**3 Time after calving (50)**

**4 Dry period (51)**

<b>5 Age</b>	<a href="#">(52)</a>
<b>6 Body size</b>	<a href="#">(52)</a>
<b>7 Time after milking</b>	<a href="#">(54)</a>
<b>8 Number of milkings</b>	<a href="#">(55)</a>
<b>9 Temperature</b>	<a href="#">(56-57)</a>
<b>10 Exercise and calm</b>	<a href="#">(58-59)</a>
<b>11 Disease</b>	<a href="#">(60)</a>





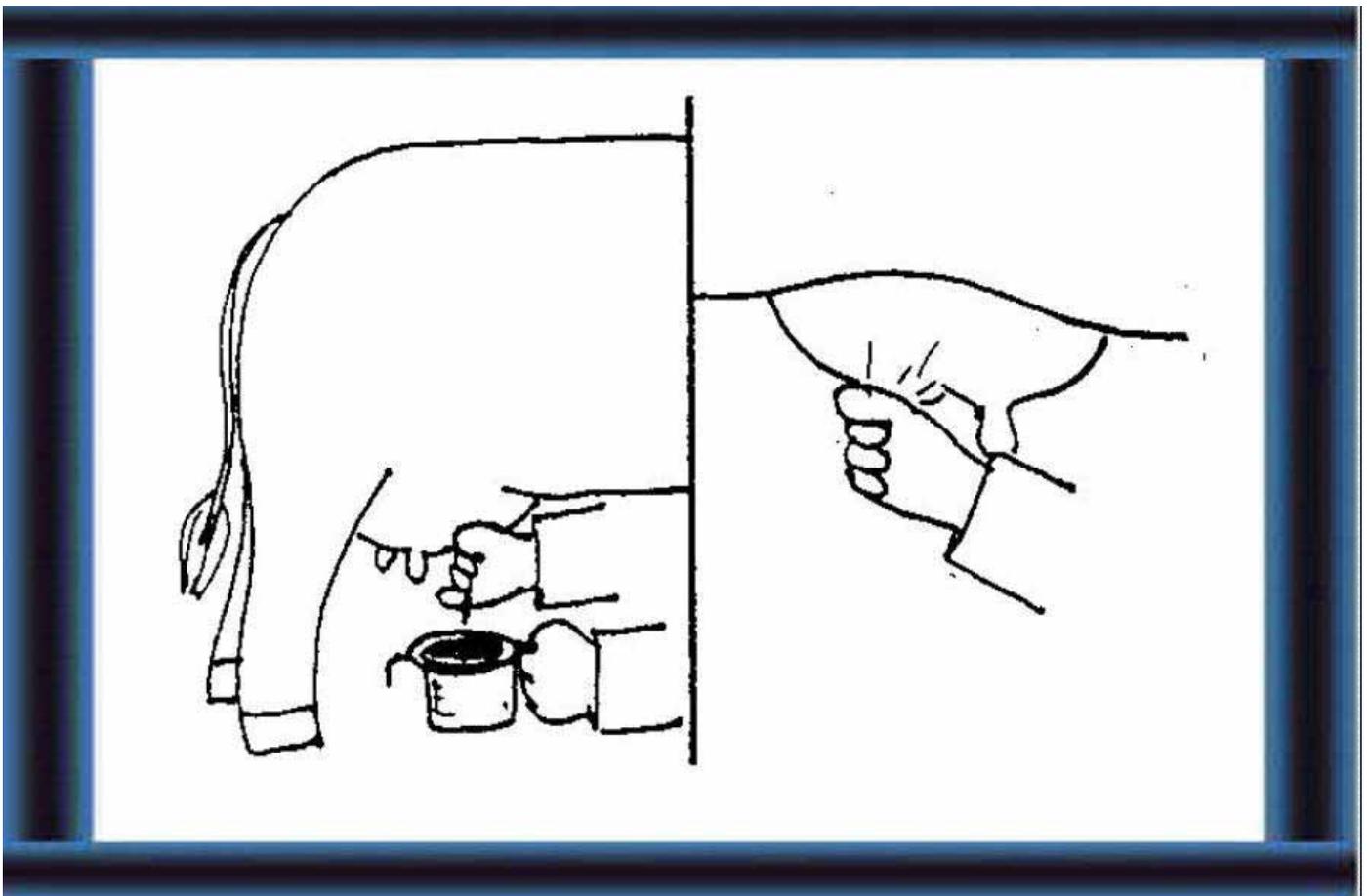
# Small-Scale Dairy Farming Manual

Volume 4

Husbandry Unit 7.2

## MILKING AND HANDLING OF MILKING EQUIPMENT

page 109



# MILKING & HANDLING OF MILKING EQUIPMENT

## Husbandry Unit 7.2:

### Technical Notes

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

### Milking of buffaloes

After calving the animals tend to produce milk for a certain time. In nature the female animals tend to lactate till the young one is well grown and could survive under harsh conditions. However, the animals have been developed to have a long and useful lactation. Most buffaloes after calving continue producing for 270-300 days. Thereafter, milking is not recommended and is uneconomical.

On calving, buffaloes like cattle produce colostrum for up to 5 days. This is fed to young calves and in several countries is eaten by human beings also. Thereafter, normal production starts. Buffalo tend to reach peak milk production within 3-4 weeks. Depending on a number of conditions (feed, care and management, season), the peak is maintained for 60-120 days and then the animal enters into a declining phase till drying at 270-300 days.

page 111

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## Extension Materials

What should you know about milking?

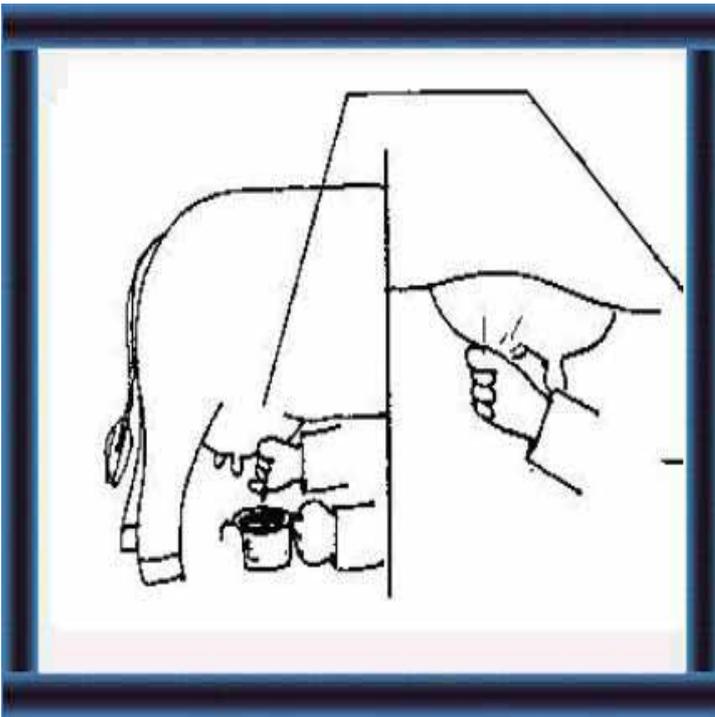
How do you prepare for milking?  
(9-29)

1 You should know how to



**prepare:**

- your milk shed
- your equipment
- your cow
- yourself.



**How do you milk your cow? (30-42)**

2 You should know how to:

- **check** your milk
- milk **correctly**.



**What do you do with your milk?  
(43-49)**

- 3 You should know how to:
- **store** your milk
  - **deliver** your milk.



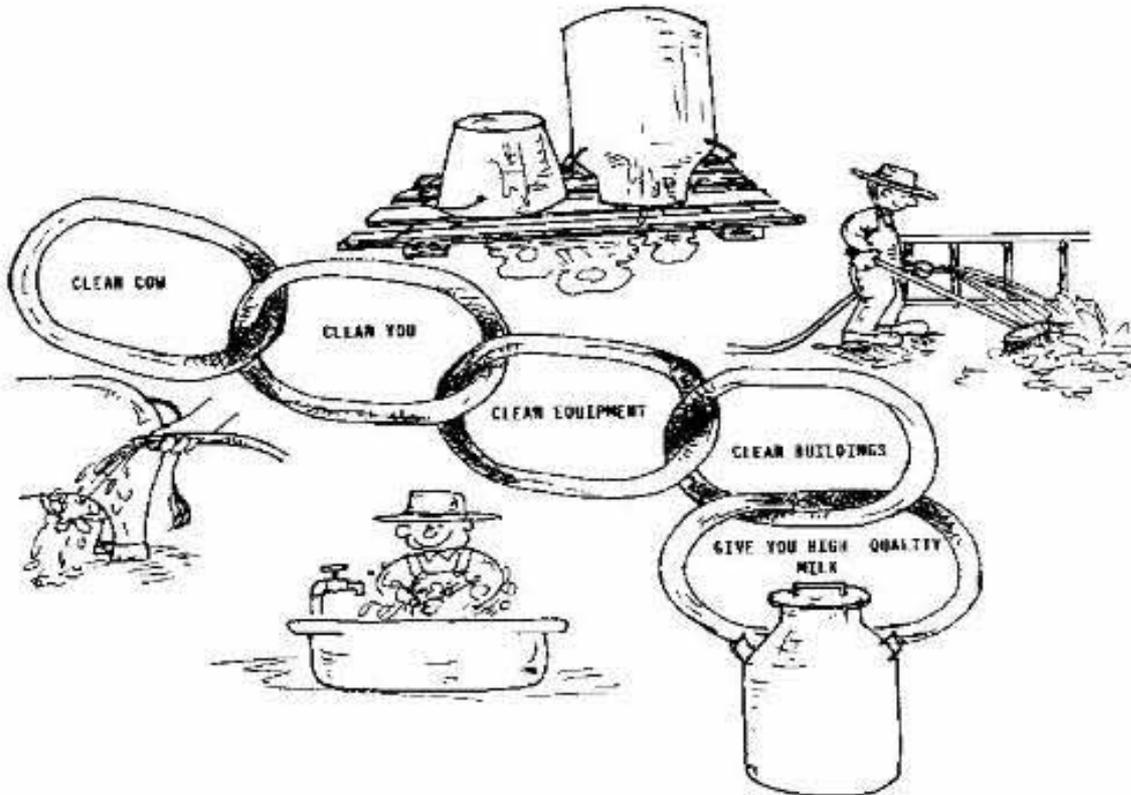
**How do you care for utensils? (50-57)**

- 4 You should know how to:
- **wash** utensils
  - **store** and **dry** utensils.

**What is important in milking your cow?**



5 To produce **high quality** milk:  
- milk your cow **correctly**  
- keep everything **clean**.





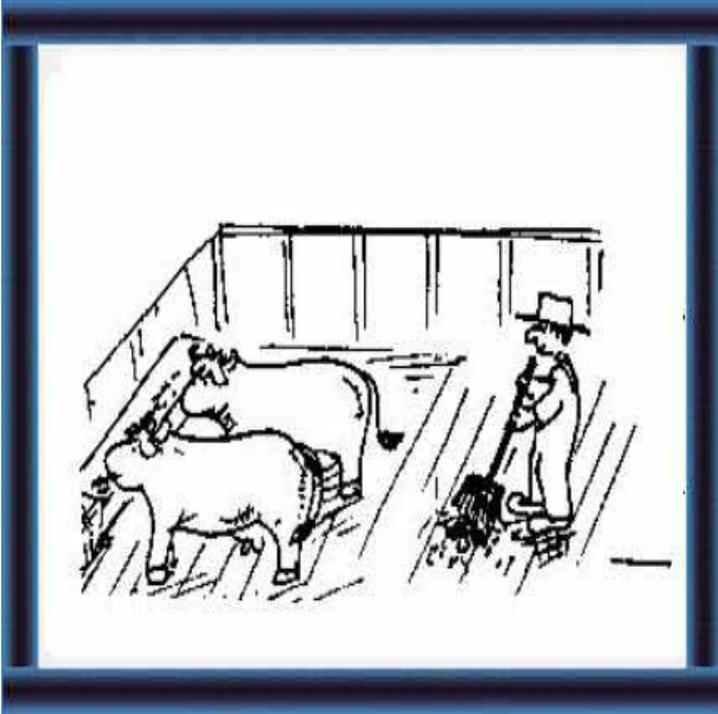
7 Incorrect milking and poor hygiene give you **low quality milk**.



8 If you are sick **do not** milk your cow.

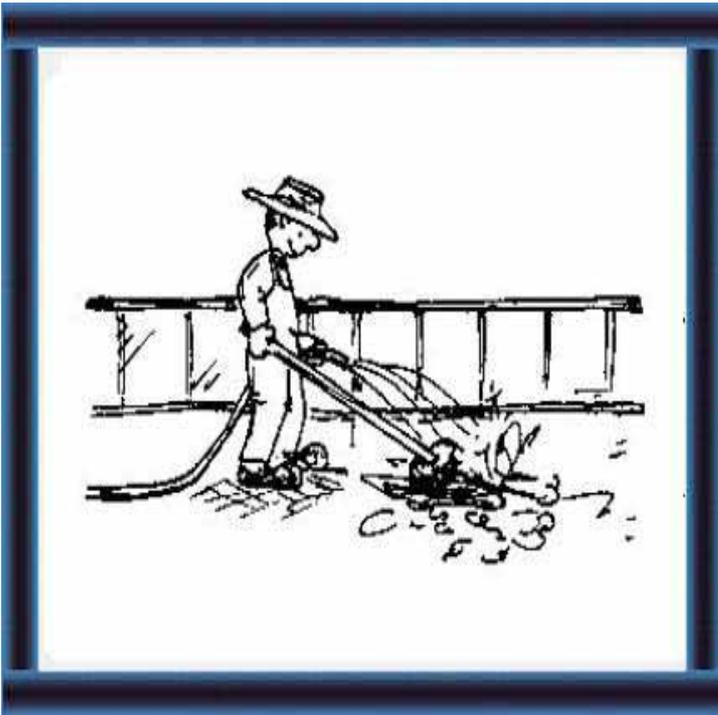
You could **pass your disease onto others**.

**How do you prepare for milking?**



### Your milking shed

- 9 Prepare the milking shed:
- **clean** the milking shed **before milking**
  - **sweep** the floor



- 10
- **wash** the floor and walls with a **disinfectant**.



### Your cow

11 **Do not scare** your cows or distress them by shouting, beating or kicking.

A scared or hurt dairy and especially buffalo cow will **not let down milk**.



12 A relaxed cow **lets down milk easier**.



13 Give your cow a **little concentrate while** you milk her.

This helps her to **stay calm**.

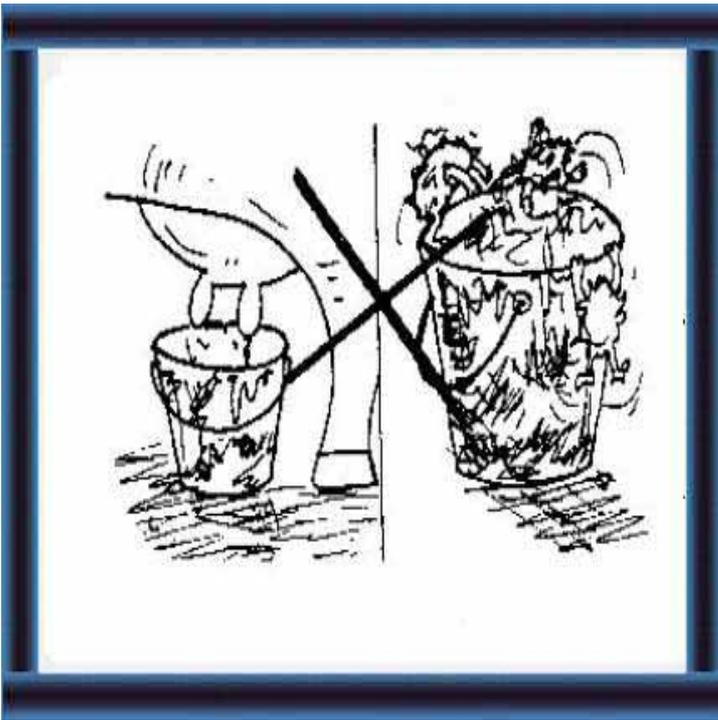


14 **Do not** feed hay or silage while milking.

The dust may **contaminate the milk**.



**Your equipment**  
**15 Make sure your equipment is clean.**



**16 Bacteria multiply quickly in dirty equipment.**

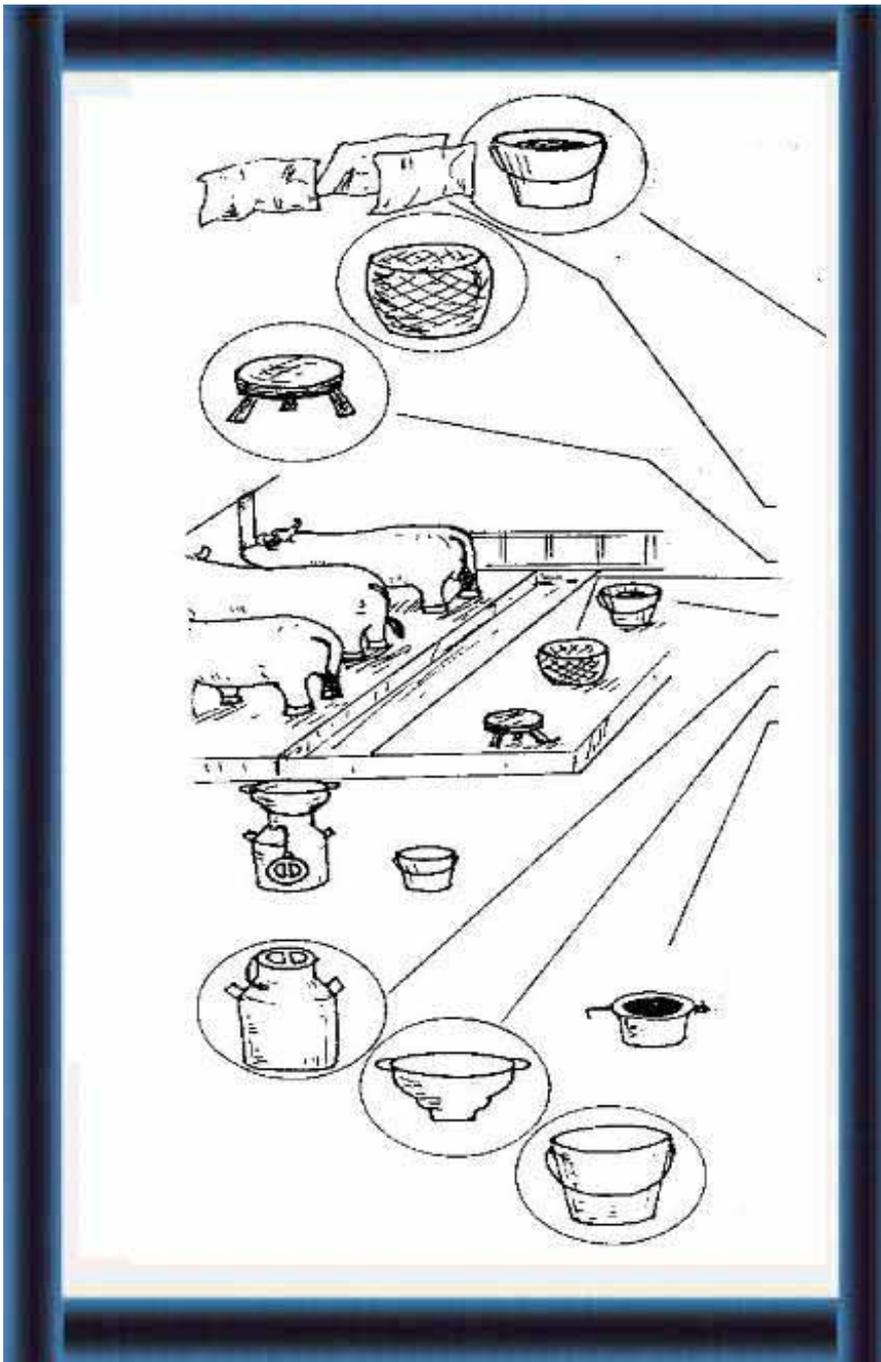
**Organize work well and make sure everything is present at the milking shed before milking starts. This has many benefits:**

- The milker will not waste time searching for items after milking has started. Time saving.**
- Milking can be carried out immediately after washing the udder. Make maximum use of the cow's let-down reflexes, which are present 5-7 minutes after washing. Milking is then easy, takes a short time, and no residual milk remains in the udder.**
- Milk should be brought straight to the churn and strained after milking. Do not leave milk in an open pail exposed to dirt and dust. This affects the milk quality.**

**One udder cloth for each cow greatly reduces the risk of spreading mastitis from one cow to another. Never put an udder cloth from a cow's udder back in the bucket of water with the clean cloths. Use a basket or some other container for the dirty cloths. (17)**

**Use the milking pail only for milk. If it is used for washing udder cloths, carrying concentrates or other purposes, the pail may well contaminate the milk during the next milking, with harmful particles left in the pail. (18)**

**17 Make sure** everything you need for the milking is ready **before** you start milking.  
**- One udder cloth** for each cow in a **bucket of clean water**.  
**- A stool** for the



milker.

- A **basket** to throw the udder cloths in after use.

- A **milking pail** which you use only for milk.

- A **churn** to collect all the milk in.

- A **strainer** with a clean straining cloth or **filter**.

- A **strip cup**.

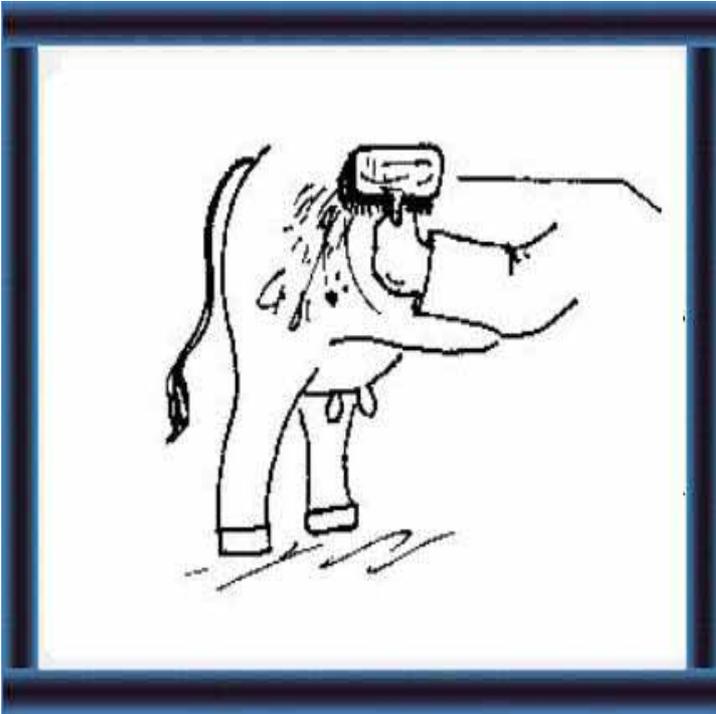
18 **Always** place the churn with the strainer **outside** the animal shed.

This **prevents** dirt, urine, fodder or other contamination from splashing in.

**Dirt and hair fall from the cow into the milking pail during handmilking and cause contamination. The strainer separates particles and hair from the milk, but bacteria and dirt left in the milk, reduce the quality and taste of the milk. A quick brush-off from the cow's side and leg reduces this risk. Do not wetwash because dirty water may run from the cow's body into the milk. (19-20)**

**Wetwash the teats and lower udder with a clean cloth and clean water. If teats are not wetwashed, the milker's hands will rub off dirt during milking. (21)**

page 120



**Washing your cow**  
19 **Brush** dirt and loose hair from the side and back leg of the cow.



20 **Do not** wetwash.



21 Wetwash the **teats** and the **lower udder**.



22 Add 10 cc of 12 % chlorine bleach to each l of water.

page 121

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**After washing the udder, wring the cloth and wipe all water off the udder with the wringed cloth. If water is left on the udder, dirty drops may fall into the milk during milking. (23-24)**

**After washing and wiping off the udder, do not put the used cloth back in the bucket with the clean cloths. The dirty cloth will spread dirt and bacteria to the clean cloths, and diseases will spread from one cow to another. (25)**

page 122

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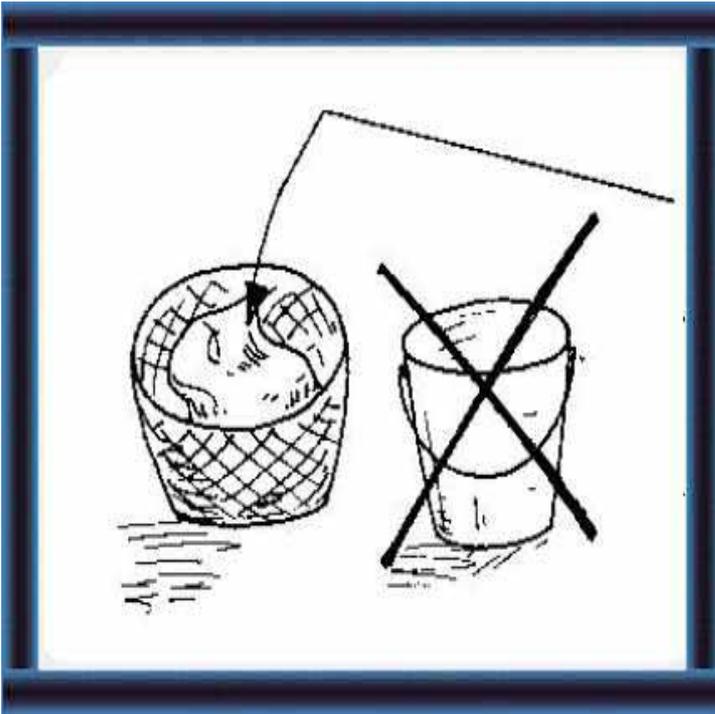


This **disinfects** the udder but does **not taint** the milk.

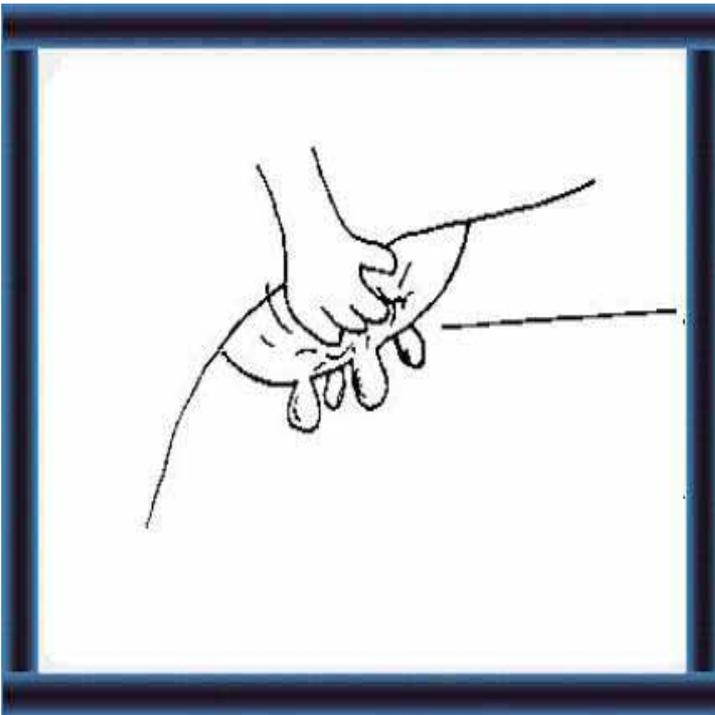
23 **Wring** the cloth.



24 **Wipe off** the teats and udder with the **same** wringed cloth.



25 Throw the used udder cloth in a basket, **not** back in the bucket.



**Massaging the udder**

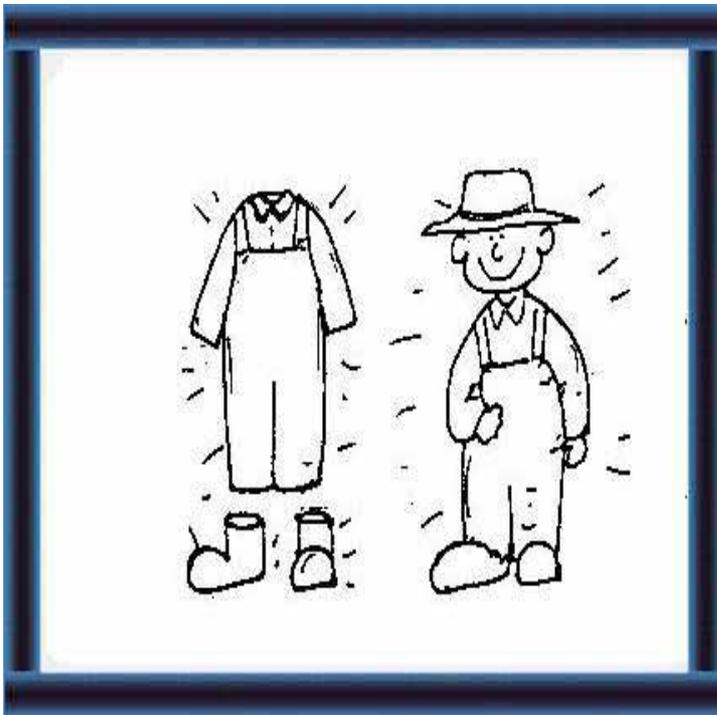
26 Massage the **back part** of the **udder** and then the **front part** and the **teats**.

This **helps the let down of milk**.

**Wash hands and make sure clothes are clean before milking. (27-28)**

**The first milk from the teats (the foremilk) usually contains a high number of bacteria. Do not mix the foremilk with the rest of the milk. Strip the foremilk in a cup, with a black plate inside (a stripcup). Examine the milk on the black plate, you can easily see lumps or abnormal colours caused by mastitis. (30-31)**

page 124



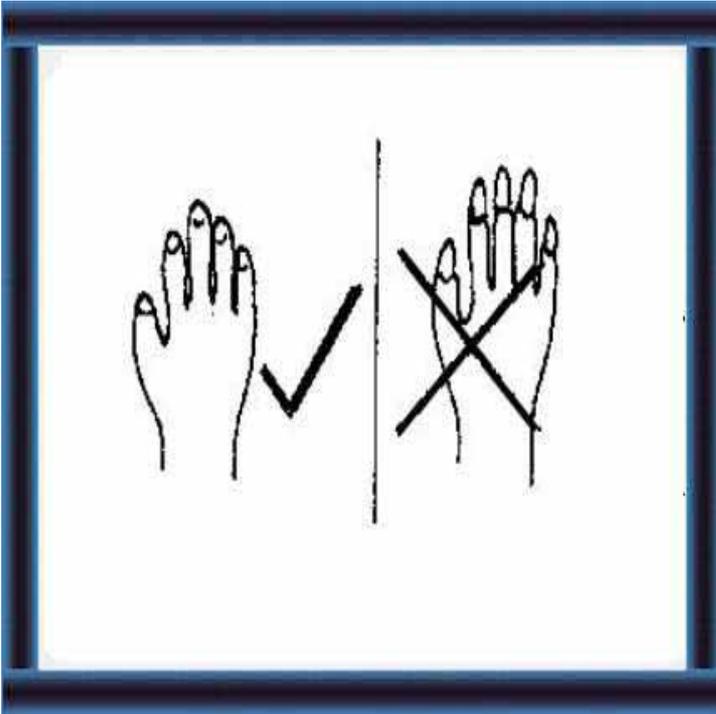
**Preparing yourself**

**27 Make sure you and your clothes are clean.**

**Finish all cleaning and sweep before milking.**

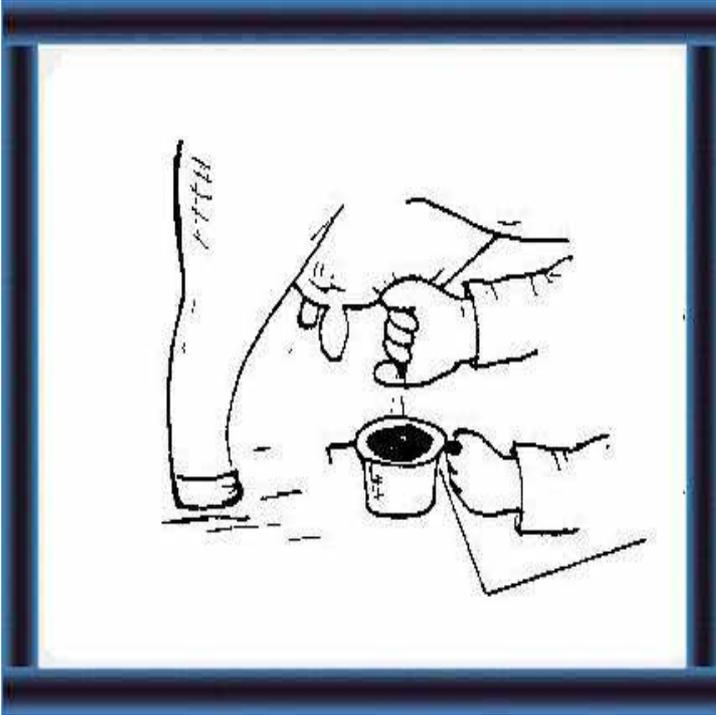


28 **Wash** your hands **before** milking.



29 **Make sure** your fingernails are **short**.

Long fingernails may **hurt** your cows.



page 125

## How do you milk your cow?

### Checking your milk

30 Begin milking, **soon** after washing.

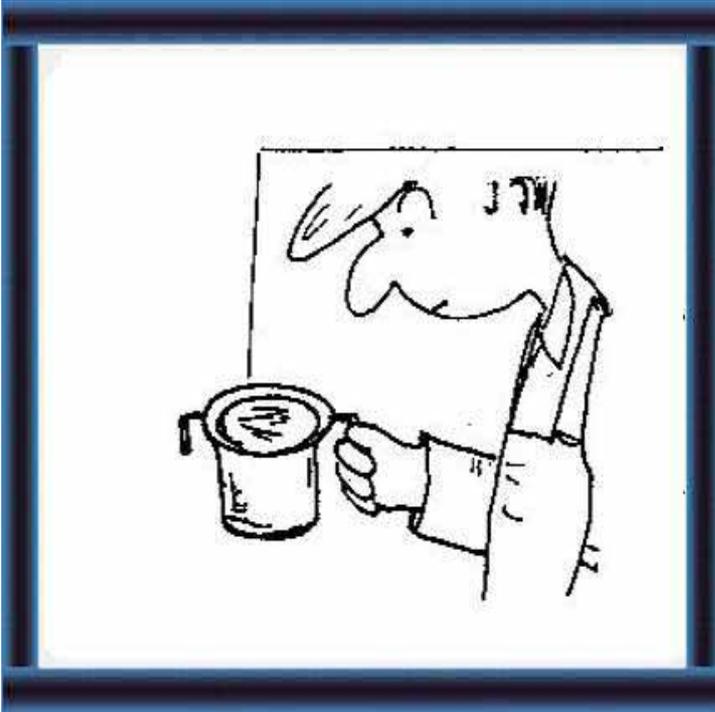
Milk out the first milk from all four teats into a **stripcup**.

**Washing stimulates the cow's udder and the cow produces a hormone called oxytocin. The blood stream carries oxytocin from the brain, where it is produced, to the udder.**

**In the udder, oxytocin causes cells surrounding to contract. These cells expel the milk towards the teats, from where it can be milked out. This is the cow's reflex for let-down of milk. the production of oxytocin and subsequent active let-down of milk, lasts only 5-7 minutes. Therefore, start milking immediately after washing. Aim to empty the udder within 7 minutes. If milking takes longer it will be hard to empty the udder, and milk will remain in the udder.**

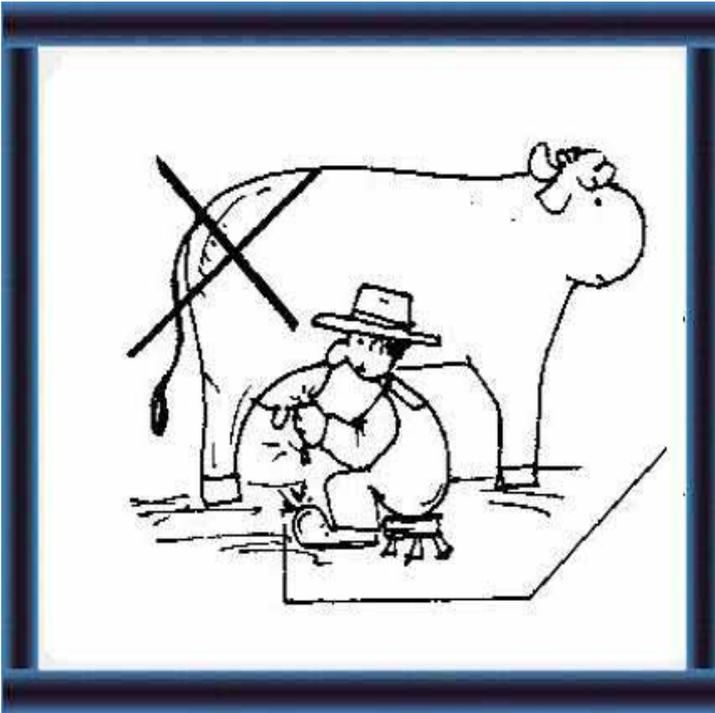
**Do not interrupt milking before the udder is empty. The cow's let-down reflexes will cease by the time you start milking again, making the milking hard and unpleasant for both the cow and the milker.**

page 126



31 **Check** the milk in the stripcup to see if it contains **lumps** or **odd colours**.

If the milk **looks abnormal**, the cow might have **mastitis**.



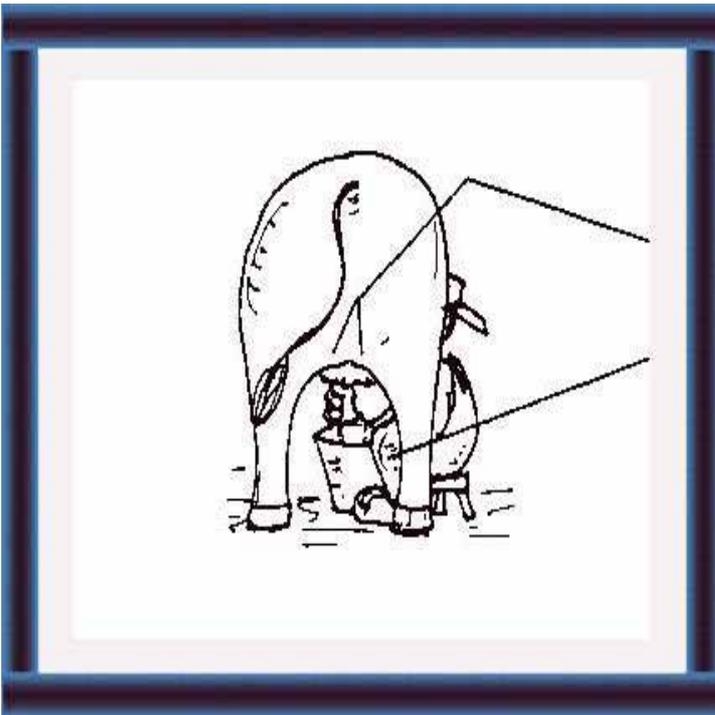
32 **Never** let the fresh milk squirt on the **ground**.

This could pass on **disease** if your cow is sick.



**Your position**

33 Sit down on a low stool **beside** the udder, with the milking pail **between** your knees.



34 Sit **close** to the cow.

Use **both hands** for milking.

Your **knee** will stop the cow from kicking over the pail.

Usually, you do **not** need to tie the tail or the back legs of the cow.

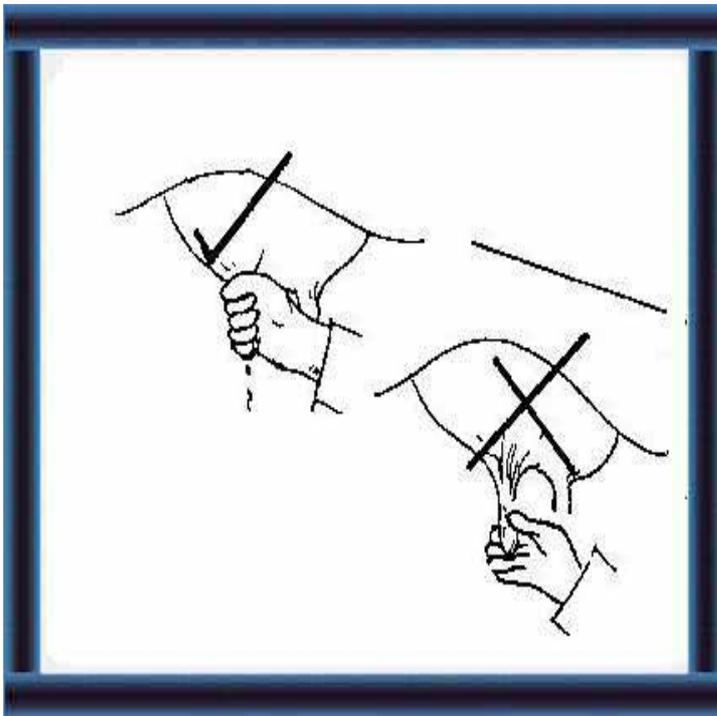
**A rhythmic squeezing of the teats with the full hands maintains a strong let-down reflex. (32-33)**

**By repeating 32 and 33, the teat is refilled from the udder and the milk can be squeezed out again.**

**The two hands of the milker alternate, when one hand is squeezing, the other one loosens the grip for refilling.**

**Do not stripmilk or strongly pull the teats with two fingers. This strains the soft tissue inside the teats and irritations here very easily lead to infections - MASTITIS. (38)**

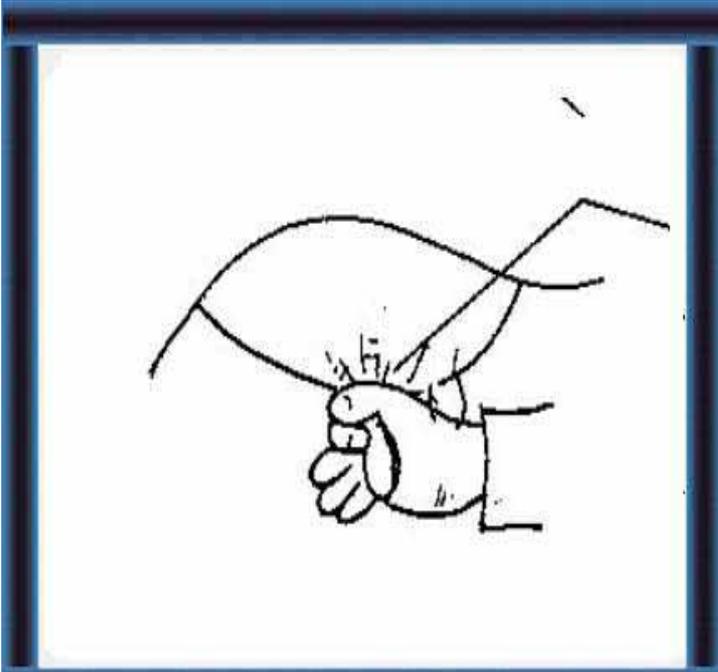
page 128



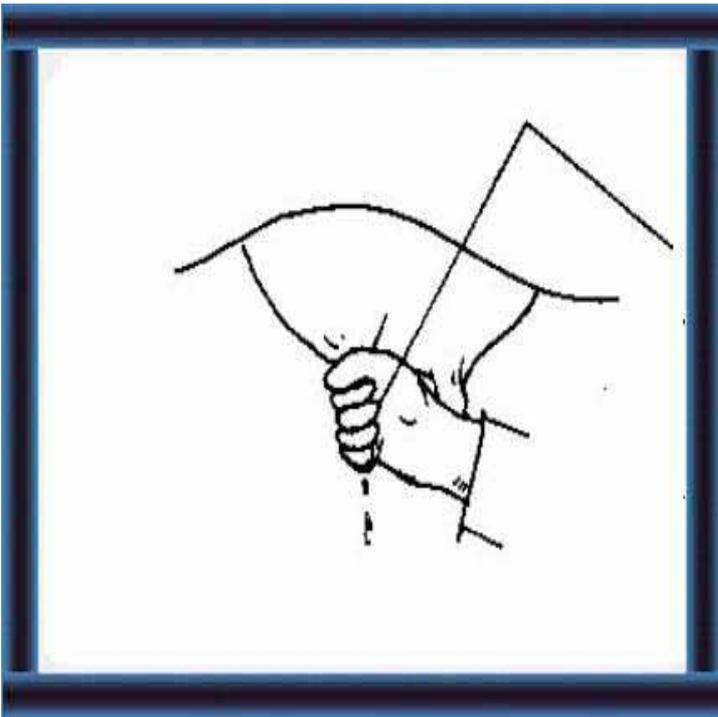
**Milking**

**35 Squeeze** milk out of the teats using your **full hands around** the teats.

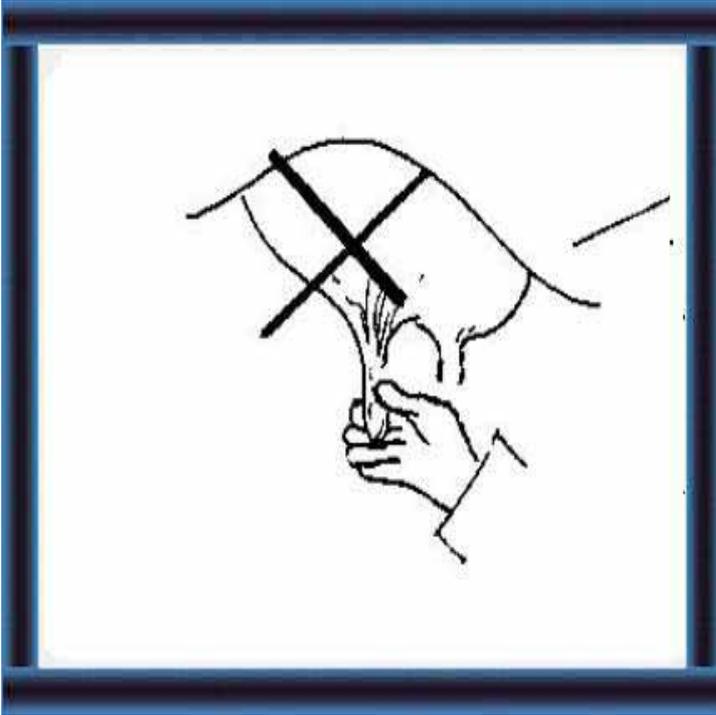
Do **not** try to pull the milk out.



36 First, **close** the canal between the teat and the udder, using **two fingers**.



37 **Squeeze** the milk out by **closing the rest of the fingers** firmly round the teat.



page 129

38 **Do not** pull the teats.

This can harm the inside of the teats, and they are **easily infected**.

Strip milking can lead to **mastitis**.  
**Important**

After you begin milking, **do not** stop until the udder is **empty**.

---

**During milking, you must maintain hygiene.**

**Do not wetmilk, which includes wetting hands with milk, water or spit, to ease the milking. It is very unhygienic, and may contaminate the milk severely. (39-41)**

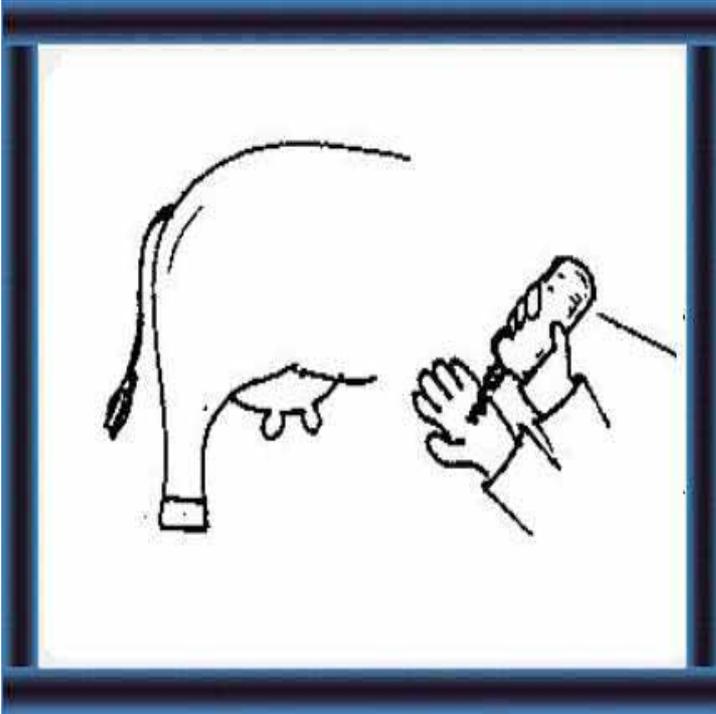
**If drymilking is difficult, use a cream with no smell or taste to moisten hands. (42)**

**Keep cream clean in a closed container.**

**Machine milking does not pose many difficulties. However, if not put to machine milking during the first lactation, it might cause several problems. Owing to teat shapes and intramammary pressure both teat cups and vacuum are slightly modified.**

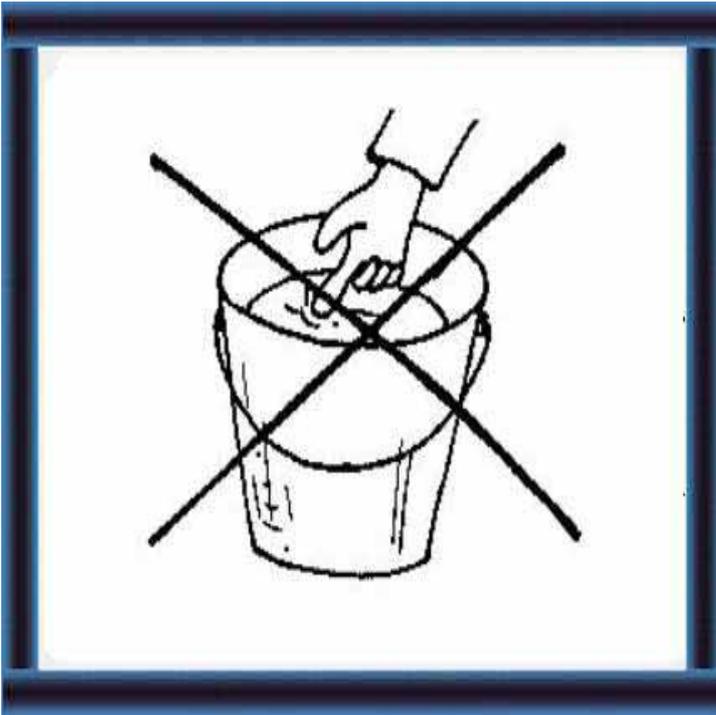
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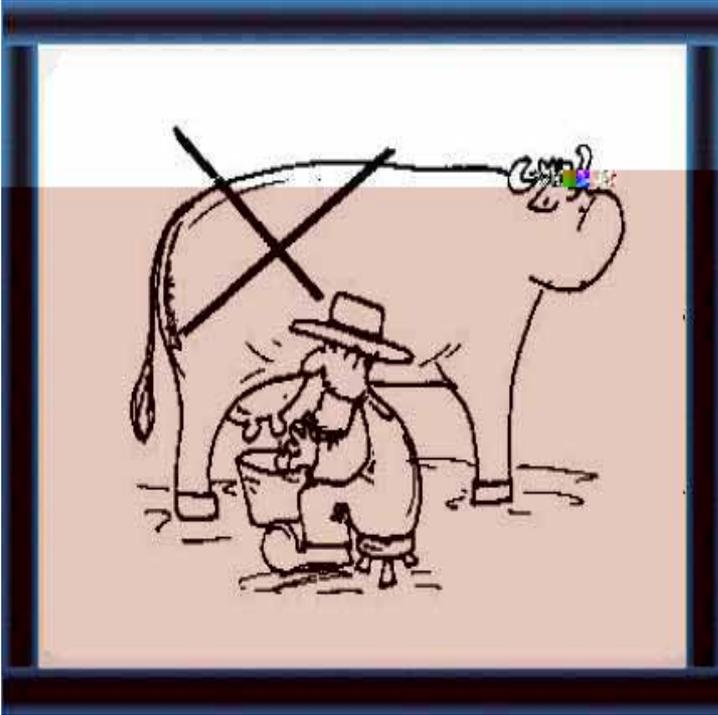


**Moistening your hands**

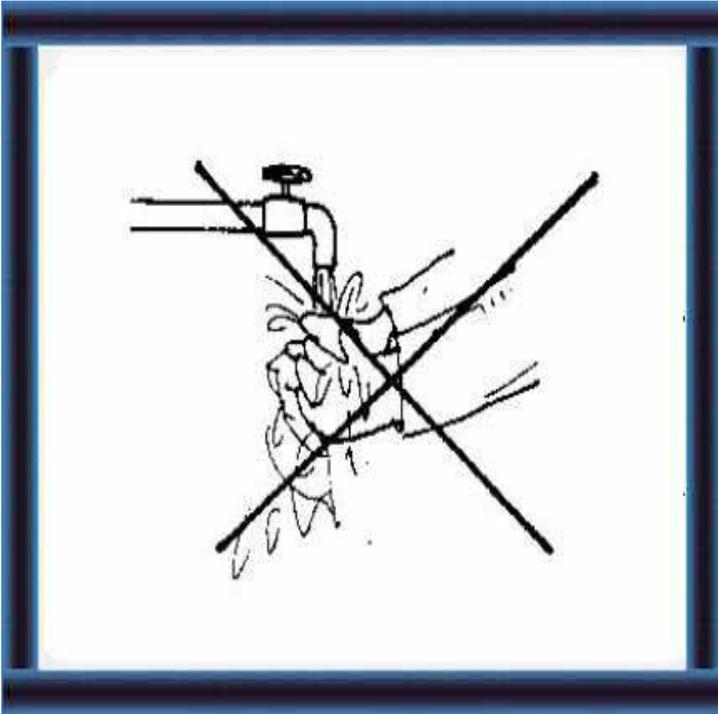
39 If you find it **hard** to milk with dry hands, you can use **cream** to moisten your hands.



40 **Never** dip your fingers in the milk to moisten your hands.



41 **Never** use spit to moisten your hands.



42 **Never** use water to moisten your hands during milking.

**Milk easily takes taste from the environment. If milk is left standing in an open bucket, dirt and dust particles can fall in and it can absorb smells or tastes from fodder, manure, pesticides or other substances in the environment. Make sure to bring the milk to the churn and strain it immediately after milking. Keep the churn in a well ventilated place out of the direct sun.**

**There are always bacteria in milk. In warm milk, the bacteria multiply rapidly, and will produce acids or other products which make the milk go bad. In cold milk, there are few bacteria.**

**Cool fresh milk quickly after milking to prevent spoilage and resulting low prices. Immediately after milking bring the milk to the collection centre where it is cooled down to a temperature (3-1C) where bacteria do very little damage to milk quality. (43-47)**

page 132



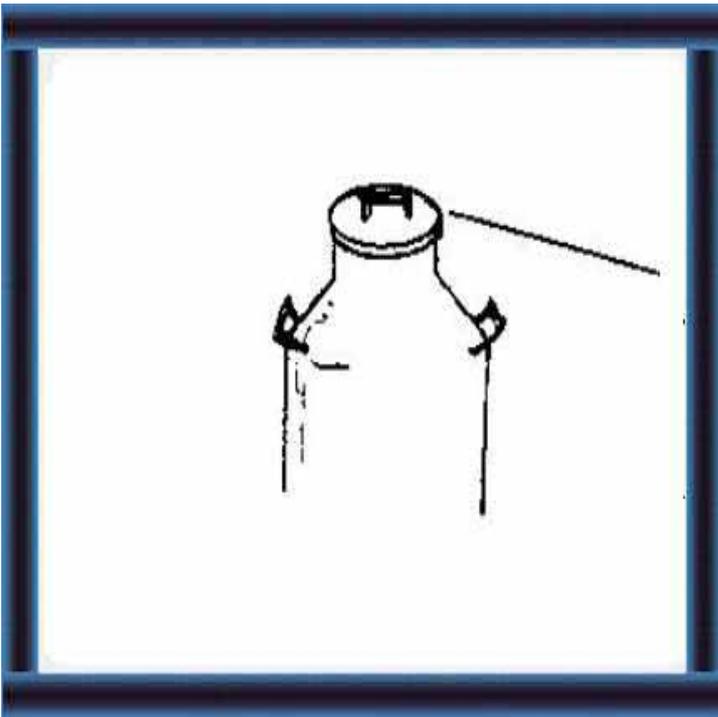
**What do you do with your milk?**  
43 When your cow is empty, bring the milk to the churn and strain it with a clean filter.



44 If the milk contains dirt, **find out** what it is:

- hair?
- skin?
- faeces?
- insects?

Find out where it comes from and **keep it out of the milk.**



45 Keep **lids** on milk buckets.



46 Handle your milk **gently**.



47 **Rough handling** causes fats to **oxidise** or split up.

This leads to **tallowy** or **rancid tastes** in your milk.



48 Keep your milk in the **shade**.



49 After milking, take the milk to the collection centre as **quickly** as you can.

Remember to **protect** your milk from the **sun** during transport.

**Most bacteria in milk come from milking utensils which are not cleaned properly.**

**Milk residues on utensils provide good living conditions for bacteria, which contaminate the fresh milk during the next milking.**

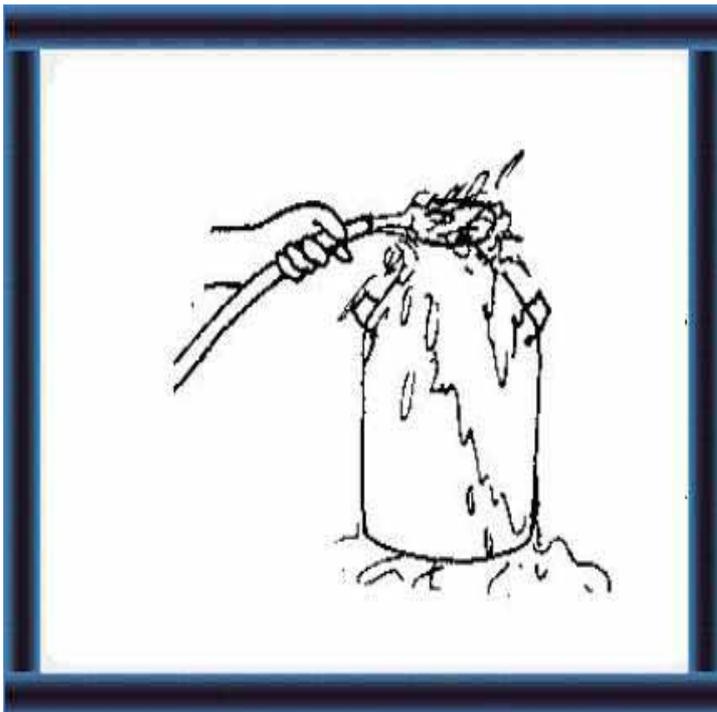
**To produce good quality milk with a low number of bacteria, wash all milking utensils thoroughly and follow routines:**

**- Rinse all milking utensils in cold water. This removes all loose particles and rinses out all water-soluble parts of the milk (i.e. protein). If you rinse immediately after milking, you clean out over 90% of all milk residue. If the milk residues dry on the utensils, it is much harder to wash them clean.**

**- Wash the utensils in hot water with a recommended dairy detergent using a brush. High temperatures help milk fats dissolve and help cleaning in general. Detergents soften the water, prevent milkstone forming and keep dirt in solution so that it does not attach to the surfaces.**

**- After washing with detergent, rinse the utensils thoroughly in clean water again.**

**- After washing, disinfect the utensils, by dipping them in a solution of disinfectant and water. Leave the utensils to dry after dipping in disinfectant solution. If local water is clean, rinse the utensils in clean water just before next milking.**



**How do you care for utensils?**

**Washing**

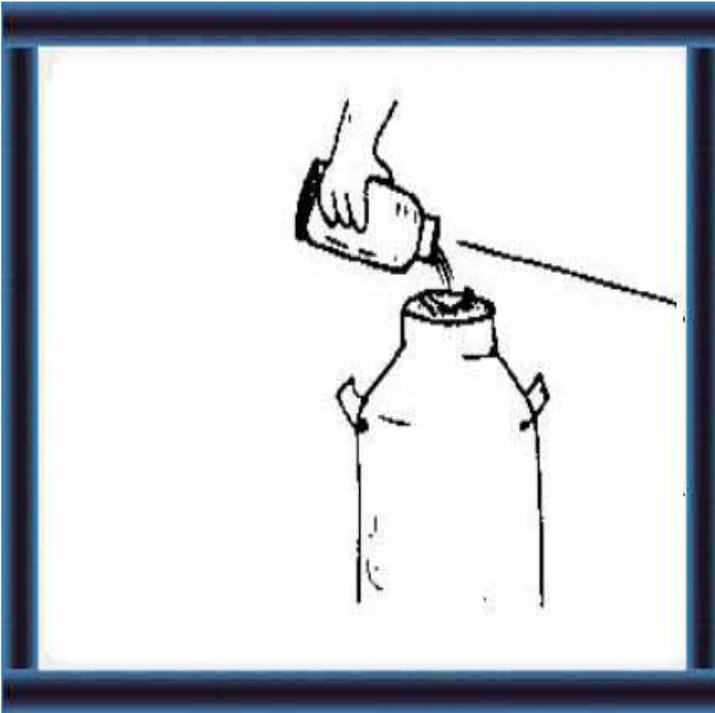
**50 Rinse all milking utensils in cold water.**



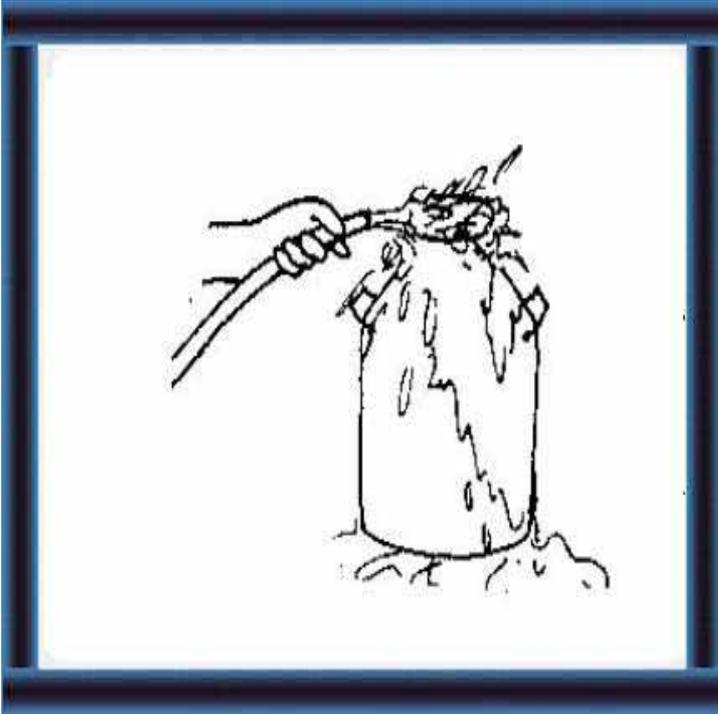
51 **Wash** the milking utensils in **hot water** with **detergent**.

Use a handbrush to **scrub clean**.

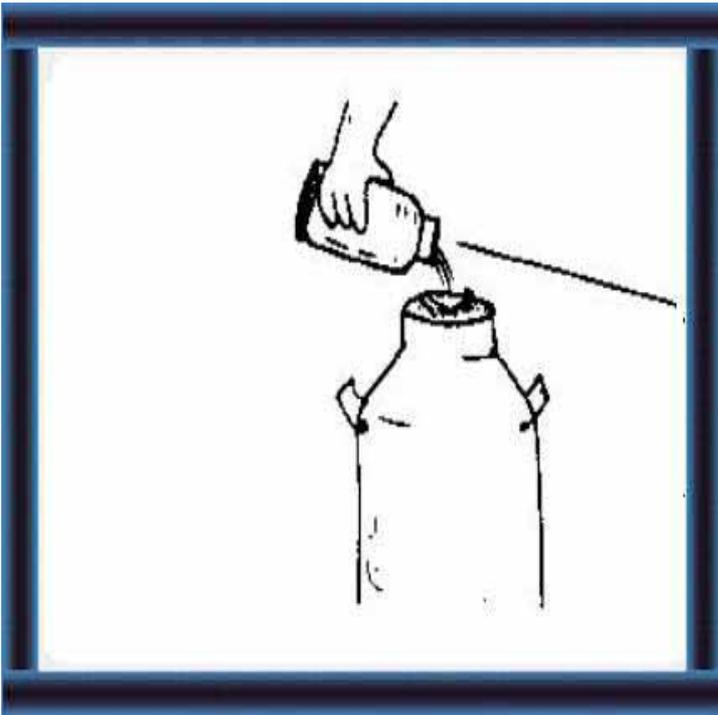
After washing with detergent **rinse** with plenty of clean water **again**.



52 Mix **disinfectant** with water, and **rinse** all the milking utensils in the solution.



53 Always **follow** the instructions and keep chemicals in a **safe place**.



**Remember**  
54 **Wash and disinfect all** stripcups, udder cloths and baskets.

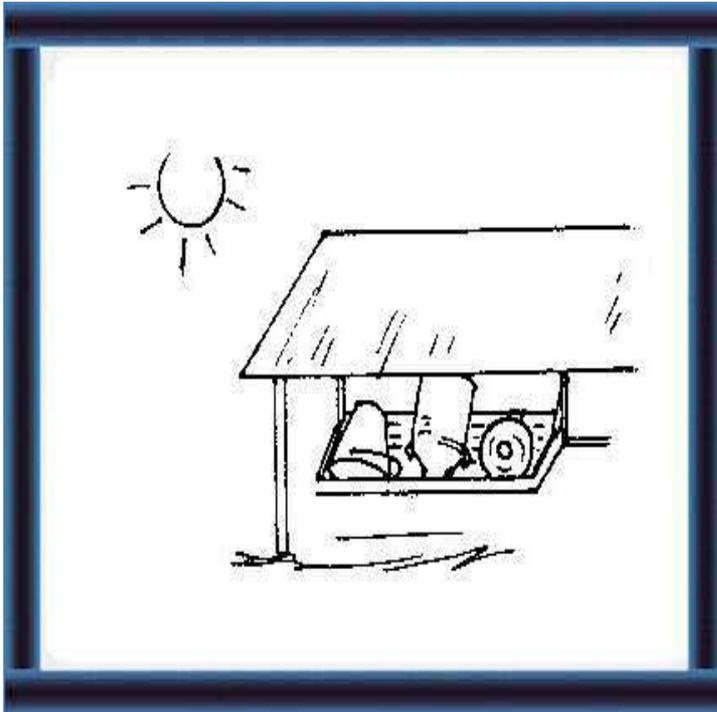
**Leave milking utensils to dry on racks in a well-ventilated, clean and tidy place. Racks should:**

- allow water to drain out from buckets and churns
- allow air to circulate so that the insides dry quickly
- be made in any available material, which is easy to clean.

**Bacteria do not live on a clean, disinfected and dry surface, but if the insides remain wet, bacteria infest the utensils, and again reduce milk quality.**

**Leave dry utensils on the racks. Fix racks in an area with little activity, dirt and dust or in a storeroom, which is clean, well ventilated, and contains no chemicals like pesticides. (55-57)**

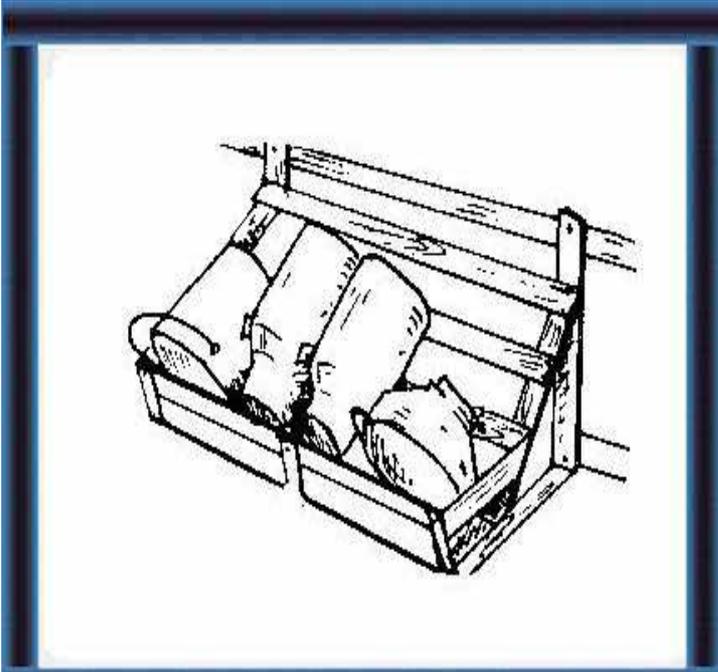
page 138



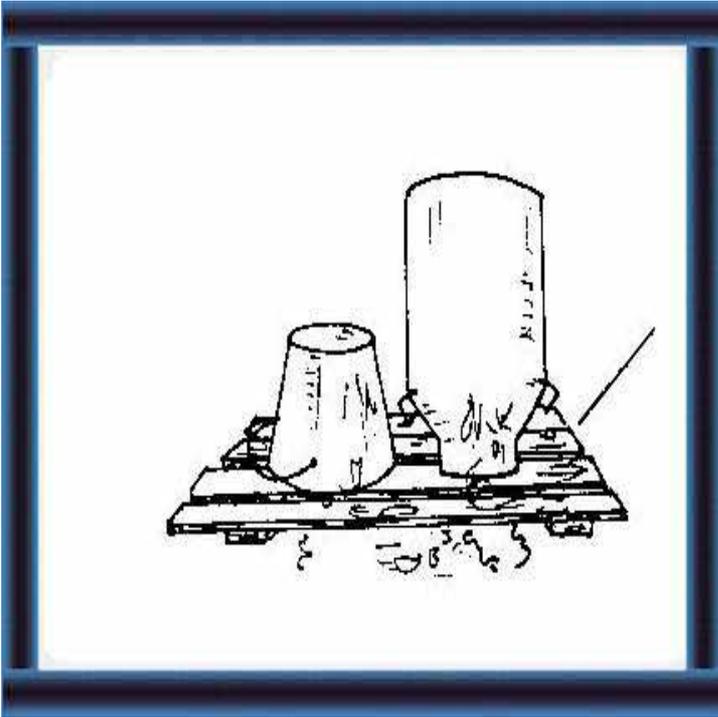
**Storing and drying**

55 When you wash the milking utensils **dry** them in a **clean and tidy** place.

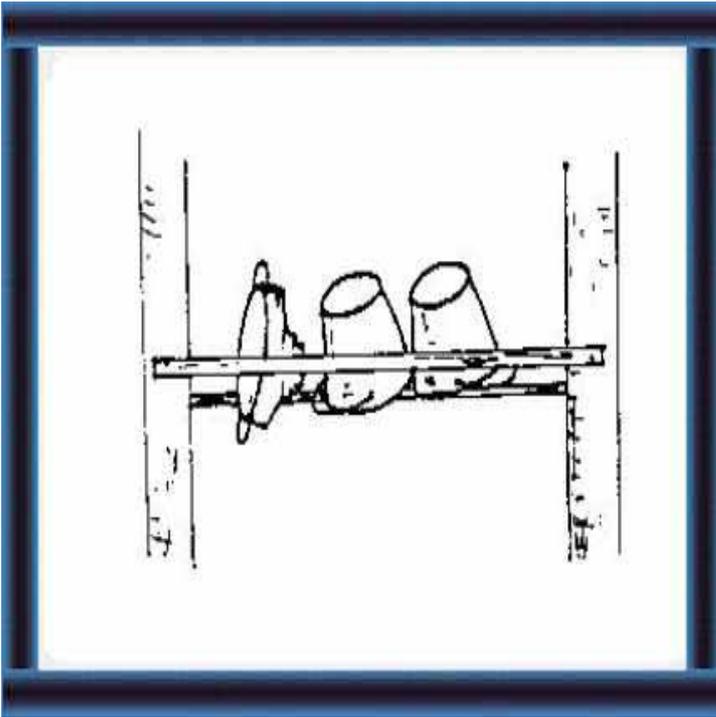
You should dry utensils in **fresh air**, preferably in **sunlight**.



56



57 Make **drying racks** for milk utensils from **suitable materials**.



58

page 139

### What do you know about milking?

#### Important things in milking

You can produce high quality milk by: **(5-8)**

- milking correctly
- not milking when you are sick
- keeping everything clean.

#### Preparing for milking

**1 Milking shed** **(9-10)**

- Sweep and wash before milking

**2 Your cow**

- Relax and feed her **(11-13)**

- Brush, wash and disinfect her **(19-22)**

- Dry and massage her **(23-26)**

**3 Your equipment**

- Clean and disinfect **(15-18)**

**4 Yourself**

- Clean clothes and hands **(27-28)**

- Cut fingernails **(29)**

#### Milking

- 1 Check milk for lumps or odd colours** ([29-31](#))
- 2 Sit in right position** ([33-34](#))
- 3 Squeeze teats with full hands, do not pull** ([35-38](#))
- 4 Use cream to moisten hands if necessary** ([39](#))
- 5 Never moisten hands with milk, spit or water** ([40-42](#))

#### Handling of milk

- 1 Strain milk** ([43-44](#))
- 2 Cover milk and handle gently** ([45-47](#))
- 3 Keep milk cool and deliver quickly** ([48-49](#))

#### Caring for utensils

- 1 Rinse, wash, rinse and disinfect** ([50-54](#))
- 2 Dry and store in fresh air or sunlight** ([55-57](#))





# Small-Scale Dairy Farming Manual

Volume 4

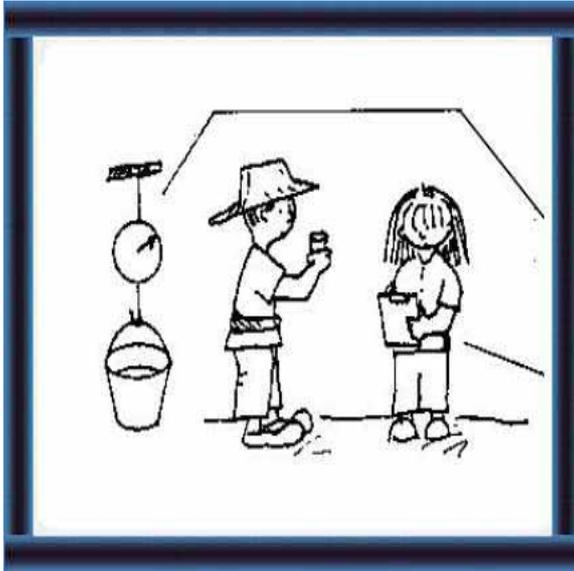
Husbandry Unit 7.3

**MILK RECORDING**



## Extension Materials

[What should you know about milk recording?](#)



**What is milk recording? (5-6)**

- Milk recording is:
- **measuring milk yield and composition**
  - **keeping records.**

**Why do you need milk recording? (7-10)**

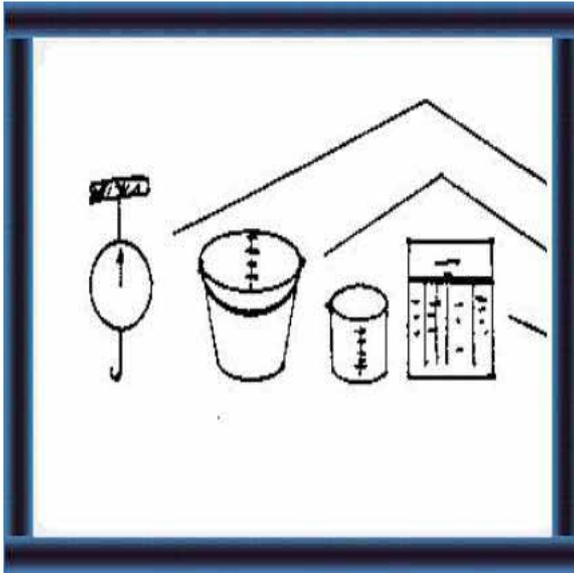


2 To make decisions about:

- **feeding**
- **selecting** animals
- **culling** animals.

**How can you record yields? (11-19)**

3 You need to:



- weigh milk yields
- take milk samples
- keep records.

What is official recording and why should you cooperate? (20-27)

4 To improve selection of animals and production of:



- your family and neighbours  
- farmers throughout your country.

page 143

## MILK RECORDING

### Husbandry Unit 7.3:

#### Technical Notes

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

**Milk recording is the process of making measurements of the yield and composition of milk produced by individual animals and recording them. (5-6)**

**Such records are of great value for making decisions on**

- feeding cattle and buffalo (7)
- selection of calves with a higher capacity to produce (i.e. calves from high yielding animals) (8)
- progeny testing of bulls (9)

**- removing (culling) unproductive animals. (10)**

page 145

**What is milk recording?**



5 In milk recording, you **measure** the:  
- milk yield  
- milk composition  
of each of your animals.



6 You **record** the yield and composition.

**Why do you need milk recording?**



7 Milk recording helps you **make decisions** on:  
- **feeding** cattle and buffalo (see H.4 Feeding)

8

- **selecting** calves from animals with **high yields**  
because they should have high yields when they grow



page 146

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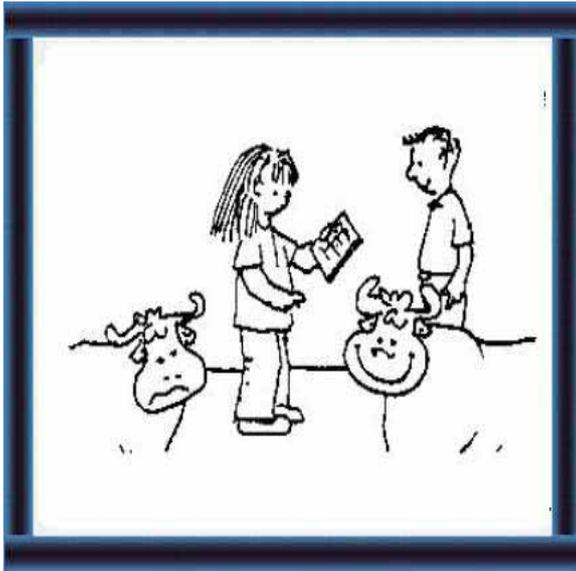
### **Recording by owner**

**In its simplest form milk recording involves the measurement and recording by the owner of the quantity of milk produced daily by each individual animal. The common practice is to measure the yield in kg using a suitable balance or a bucket or other container calibrated in 0.5 kg intervals. (11-12)**

**The daily yield is used as a basis for making decisions on feed-ing. (See Unit H.4)**

page 147

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9  
- **selecting bulls** which can produce animals with high yields



10

- **culling animals** with low production.

**How can you record daily milk yield?**



11 You usually **measure** daily milk yield in kg:  
- with a suitable **balance**



- or with a **bucket** marked for each  $\frac{1}{2}$  kg of milk.

Daily yield helps you **make decisions** on feeding. (H.4)

page 148

**The lactation yield is obtained by adding the daily yields. This is a valuable criteria for making decisions on culling unproductive animals and selecting of calves. (13)**

**An improvement on this simple method would be to get the butter fat content measured about once a month. Assistance of the extension officer or the dairy cooperative will have to be obtained for this purpose. (14)**

**To measure the average fat content of the milk on a particular day, a proportionate sample of the milk produced at each milking during the day has to be collected, e.g. if 10 kg are produced in the morning and 5 kg in the afternoon milk, the sample has to contain 10 ml from morning milk and 5 ml from afternoon milk. A preservative like Potassium Dichromate has to be added to the sample to prevent it clotting. (15-16)**

page 149



13 By adding **all** the daily yields for one animal, you get the **lactation yield**.

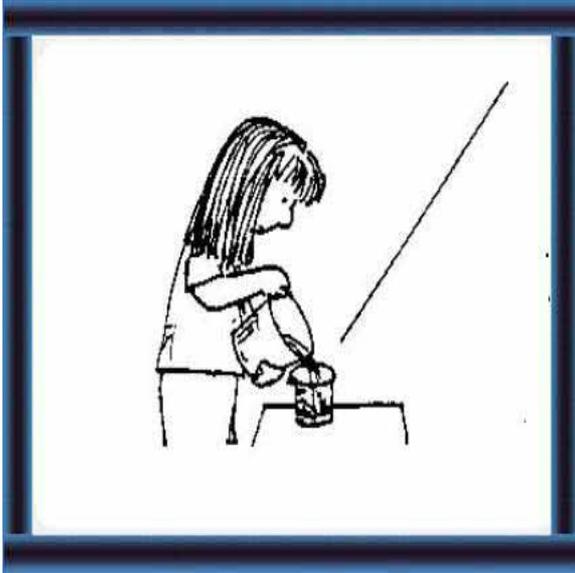
This helps you **decide** on **culling** and **selecting** calves.

14 You should also measure the **butter fat content** of

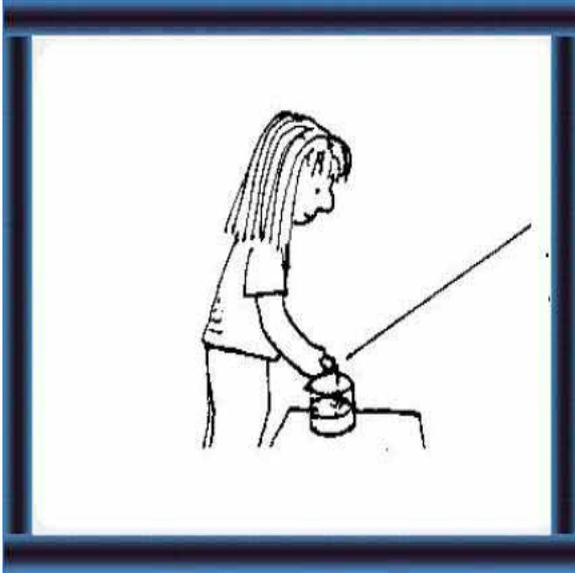


your milk once a month.  
Consult your extension worker or dairy cooperative.

15 Take a **0.1 % sample** from **each milking** on one day of the month e.g.



- 10 ml if you have 10 kg of morning milk
- 5 ml if you have 5 kg of afternoon milk.



16 Add a little **preservative** (e.g. Potassium Dichromate) to stop the sample clotting.

page 150

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**Information on daily milk yield of several cows can be recorded in a single page as shown opposite. (17)**

**Information on monthly milk yields can be recorded in the format given in Annex I. (18)**

**When lactation is completed, the information on each individual cow can be recorded in the format given in Annex II. (19)**

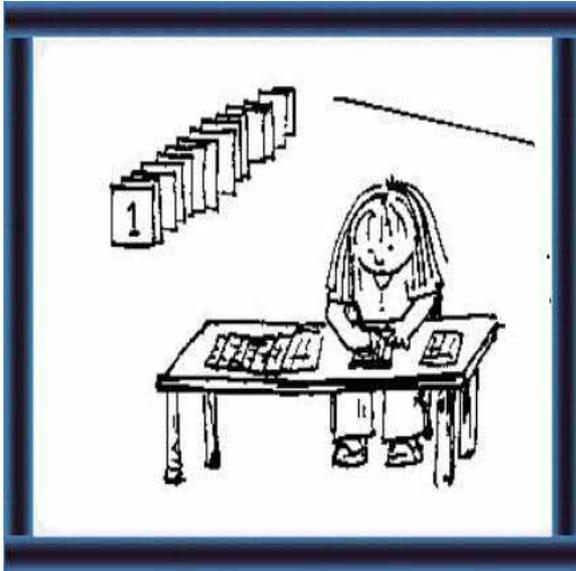
page 151

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17 You can use this table to record **daily** milk yields.

**Daily milk yield (kg) during the month of \_\_\_\_\_**

Date	Cow No. 1		Cow No. 2		Cow No. 3		Remarks
	am.	pm.	am.	pm.	am.	pm.	
1							
2							
3							
4							
5							
<b>Results of Butter Fat Test</b>							



18 You can use the table in Annex 1 to record **monthly** milk yield



19 and the table in Annex 2 to record **lactation yield** for each of your animals.

## Official recording

**In Asia only a few countries have official milk recording schemes. Even in those countries, only a few herds in a limited area are covered.**

**In official recording, an extension officer from the government or from the dairy cooperative visits each farm, records the milk yield of each individual animal and collects appropriate samples for measuring the milk composition. Subsequently, the farmer is provided with information on yield and composition of milk of each cow. (20-21)**

**As official recording involves heavy cost, mainly on salaries of recorders and their travelling expenses, an attempt is made to reduce the number of visits. Some of the practices adopted are:**

- fortnightly recording, which is adequate for all recording purposes; (22)

- **monthly recording, which gives a high accuracy for progeny testing purposes, but which only gives some guidance in selecting and feeding individual animals;** (23)

page 153

**What is official recording and why should you cooperate?**



20 In official recording, an extension worker from the government:

- visits your farm
- records milk yields for each animal
- takes samples to measure composition.



21 After checking, he sends you information on:

-your **milk yields**

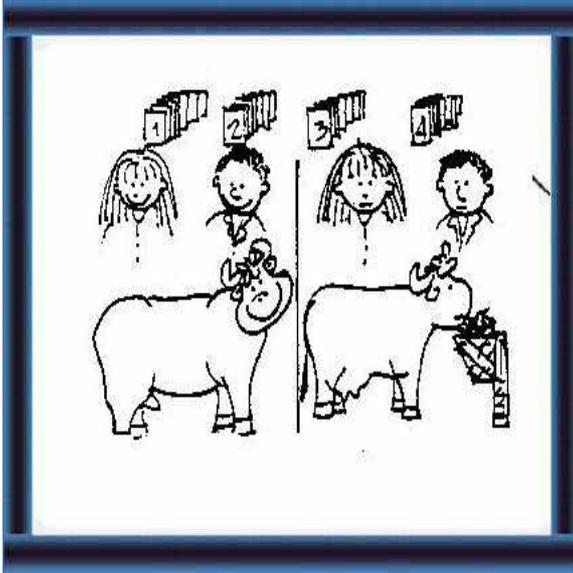
-the **composition** of your milk.

22 **Frequent visits** are better but cost a lot of money.



Visiting **every two weeks** is best for recording.

23 Visiting **every month** is :  
-enough for breeding purposes



-enough for some guidance for feeding and selecting animals.

page 154

- bimonthly recording, which is adequate for progeny testing but not sufficient for individual selection and feeding; (24)

- a.m. and p.m. sampling, where morning milk is weighed and tested in one month and afternoon milk is weighed and tested next month - more accurate than bimonthly but less accurate than monthly recording. (25)

Whatever the procedure adopted, farmers should be encouraged to cooperate with any official recording programmes, because they serve as a basis for:

- checking farmer's own recordings for deciding on individual animal selection and feeding; (26)

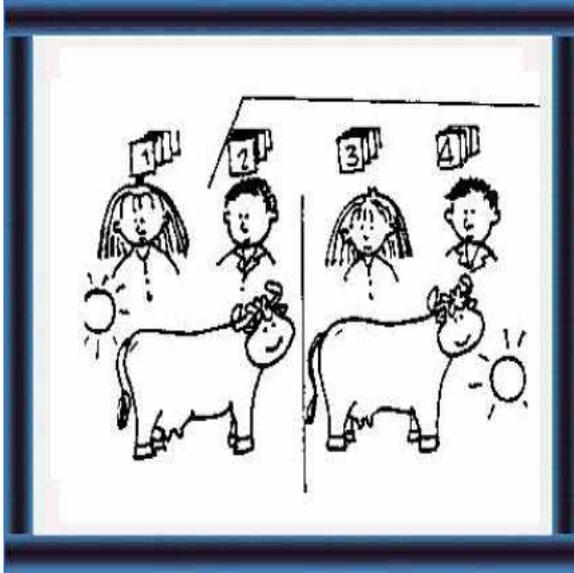
and

- improving the productivity of the national cattle and buffalo herds through sire selection by progeny testing. (27)

page 155



24 Visiting **every 2 months** is:  
-enough for breeding purposes  
-**not** enough for guidance on feeding and selecting animals.



25 Visiting to weigh and test:  
-**morning** milk one month  
-**afternoon** milk the next month  
is better than visiting every two months.

26 **Cooperating** with official recording **helps you** by:



-**checking** your recording  
-giving you **guidance** on **feeding** and **selecting** animals.

27 It also helps **improve** the **selection** of animals and **production** of farmers  
-in your neighbourhood



-in your country.

**Annex I**

**Monthly Milk Yield**

Year:..... Month	Cow No.		Cow No.		Cow No.	
	Milk kg	Fat %	Milk kg	Fat %	Milk kg	Fat %
January						
February						
March						
April						
May						




Keywords

History (sheet) of cow  
Fertile Service  
No. of days in Milk

Tattoo No.  
Age at the calving  
No. of days dry

**What do you know about milk recording?**

**What milk recording is**

- 1 Taking measurements of yield and composition (5)**
- 2 Keeping records (6)**

**Reasons for milk recording**

**To make decisions on:**

- 1 Feeding (7)**
- 2 Selecting calves**
- 3 Selecting bulls (9)**
- 4 Culling (10)**

### Recording yields

<b>1 Daily milk yield (decisions on feeding)</b>	
- balance	(11)
- graduated bucket	(12)
<b>2 Lactation yields (decisions on culling, selection)</b>	(13)
<b>3 Butter fat content</b>	(14-16)
<b>4 Daily record form</b>	(17)
<b>5 Monthly record form</b>	(18Annex I)
<b>6 Lactation record form</b>	(19 AnnexII)

### Official recording

<b>1 Farm visits:</b>	
- recording yields and sampling	(20)
- information and guidance	(21)
- 2 weekly visits	(22)
- monthly visits	(23)
- 2 monthly visits	(24)
- monthly morning/afternoon sampling	(25)
<b>2 Reasons for cooperation</b>	(26-27)





# Small-Scale Dairy Farming Manual

Volume 4

Husbandry Unit 8

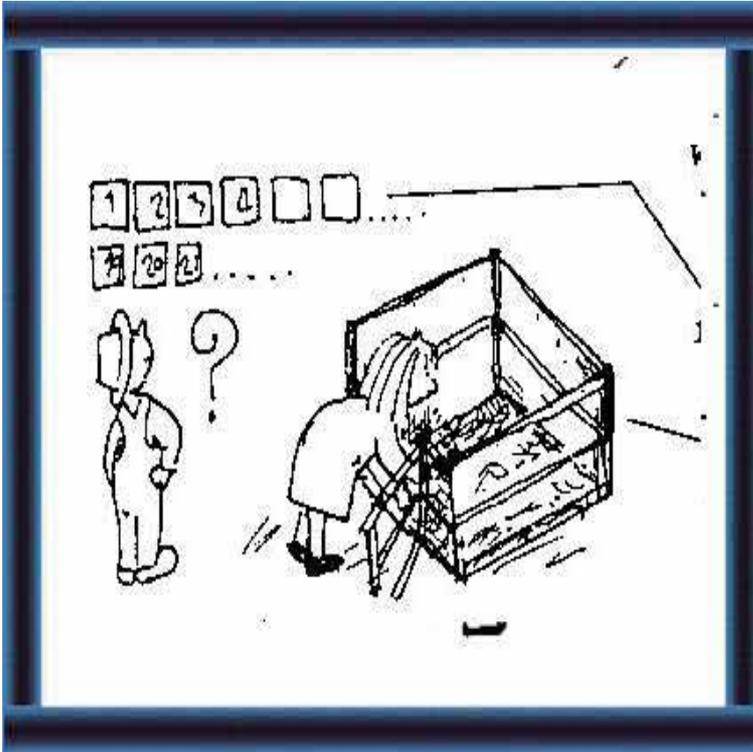
**CALVING**

page 161



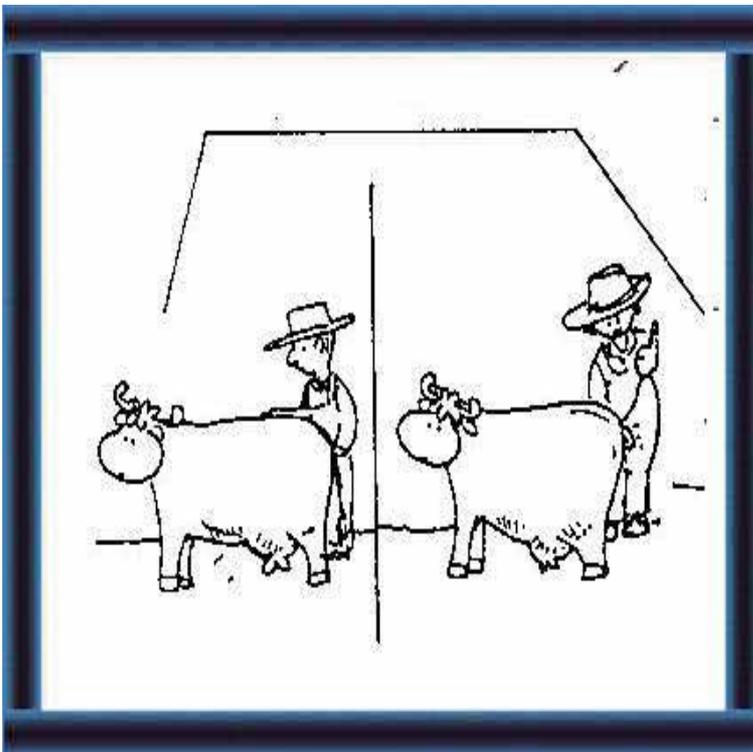
# Extension Materials

## What should you know about calving?



### How do you prepare for calving? (5-20)

- 1 You should know how to:
- estimate the **date** of calving
  - prepare the **calving site**.



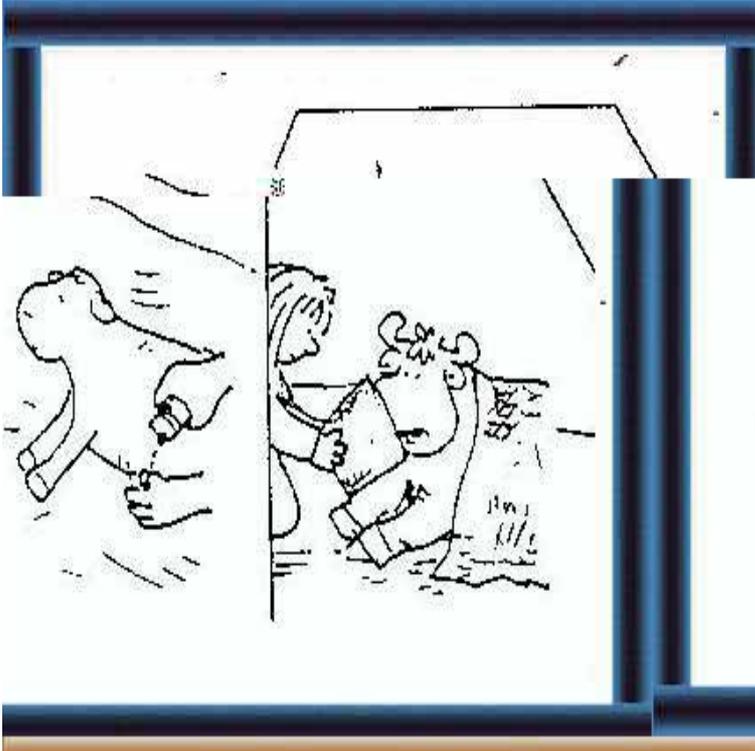
### What are the signs of calving? (21-27)

- 2 You should know:
- **signs 1-2 weeks before** calving
  - **signs just before** calving.



**What do you see and do during calving? (28-45)**

- 3 You should know:
- when to leave your cow **alone**
  - how to **help** if necessary
  - when to call the vet.



**What do you do after calving? (46-68)**

- 4 You should know how to **care for**:
- your calf
  - your cow.

# CALVING

## Husbandry Unit 8:

### Technical Notes

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

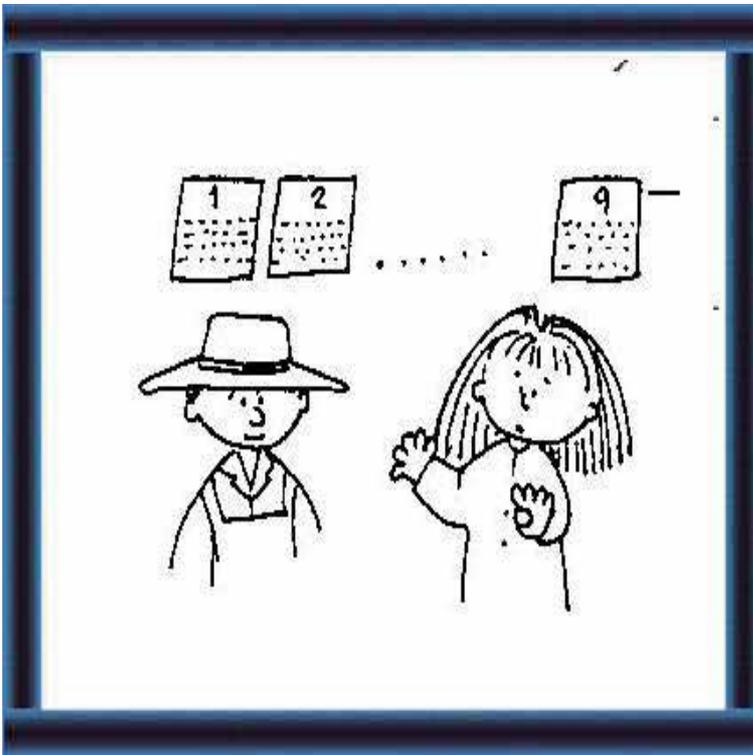
#### Preparation before calving

**Calculate the approximate calving date from the A.I./mating date. Pregnancy in cows lasts 274 -291 days. (5-6)**

**Pregnancy in buffaloes lasts 308 - 343 days. Riverine buffalo usually have a shorter pregnancy than Swamp buffalo.**

page 165

How do you prepare for calving?



5 You know that your **dairy cow** gives birth about **9 months after** successful A.I. or natural breeding.

Your **dairy buffalo** gives birth after about **10 months**.

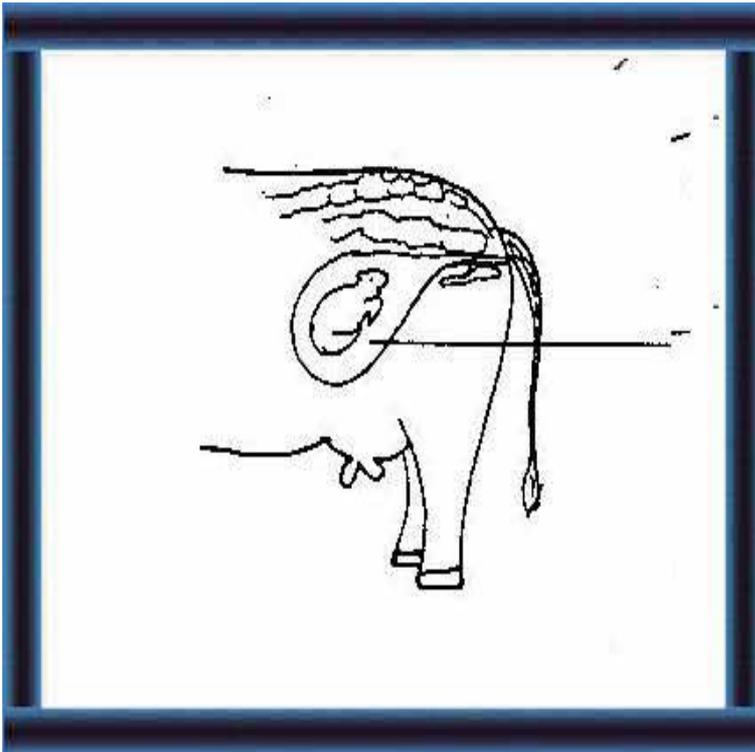


6 Consult your **breeding calendar** and your **extension worker**.

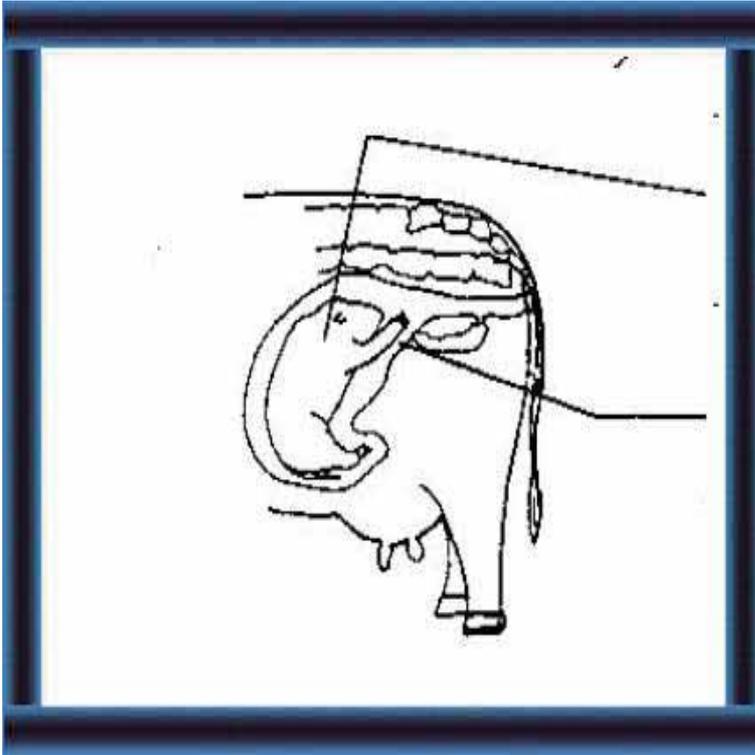
The **length of pregnancy** depends on:

- breed
- your animal (age, no. of calvings, calf sex, twin/single calves).

See H 6.2 Breeding Calendars.

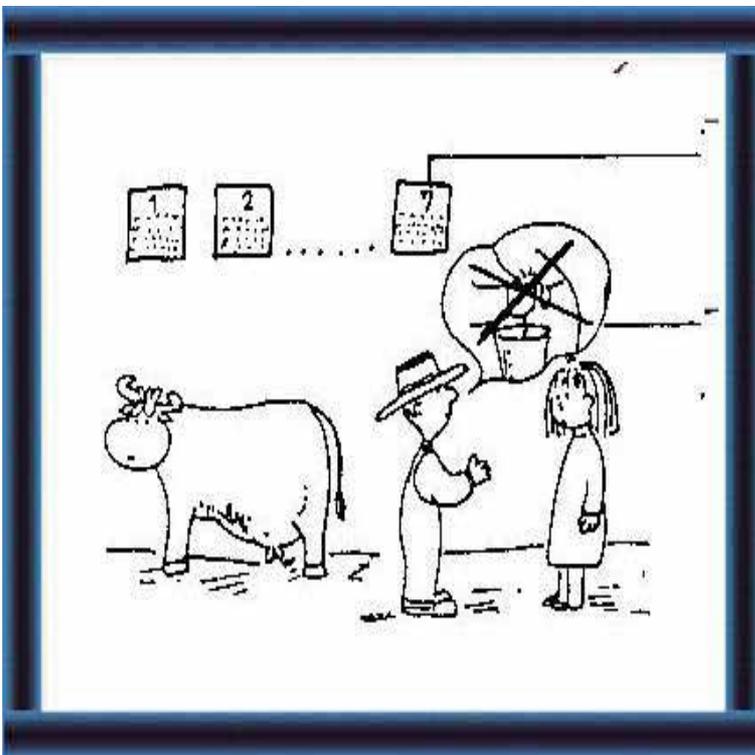


7 Your calf **grows slowly** at first and is about this size at **7 months** (about one third of birth weight).



8 This is your calf **just before birth.**  
This is the correct position - **legs forward** with head on the legs for easy birth.

page 166



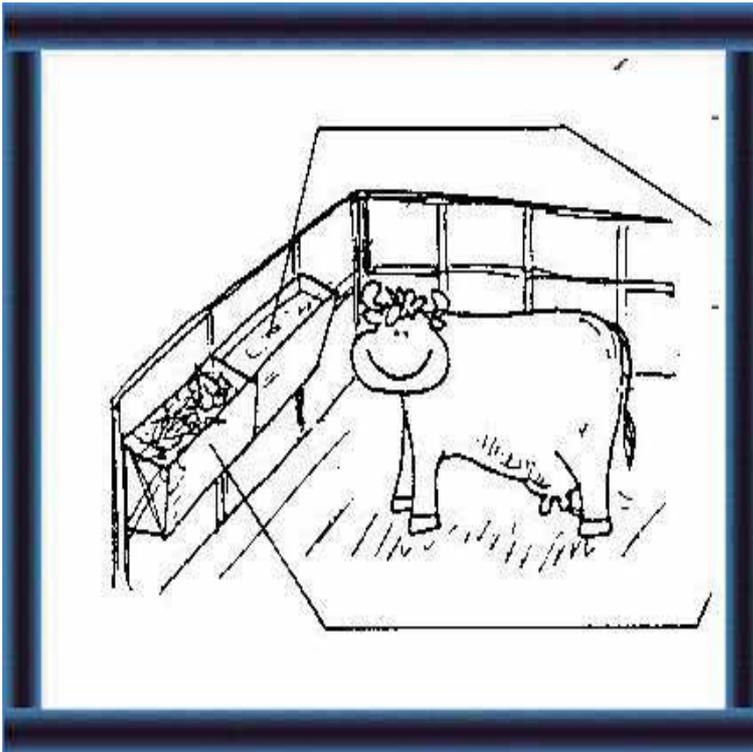
**Drying off**

9 **Dry off** your cow **2 months** before expected calving.

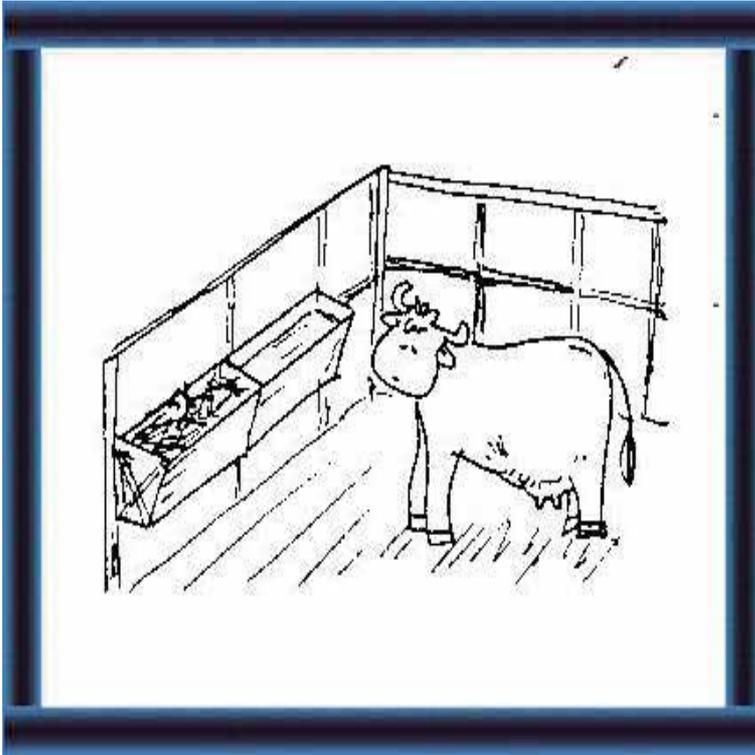


### Rations

10 Increase the rations **1 month before** expected calving.



11 If your cow is in **good condition** give daily:  
- clean water (freely)  
- good quality grass (freely)  
- enough concentrates and minerals.



12 If your cow is in **poor condition**, consult your extension worker about feeding.

page 167

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**Prepare the calving site. Always separate the calving site from the rest of the herd. Use a protected outside area or a calving box. Make the calving box at least 180 cm x 180 cm. Clean and disinfect it before use. Provide sufficient bedding where possible. (15-18)**

page 168

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**Equipment**



**13 Prepare equipment and store in a **clean** place **one week** before expected calving:**

- clean bucket for water
- soap
- small bottle of tincture of iodine (make sure the iodine is not adulterated)



**14**

- a 2 m strong, clean rope 1 cm thick (or an obstetrical chain)
- a 1 m strong, clean stick.

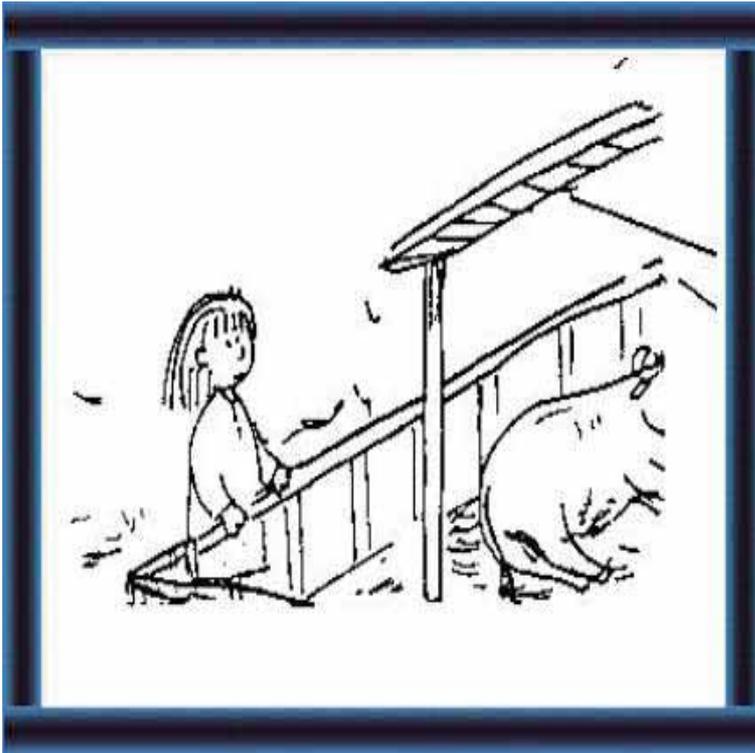


### Calving site

15 **Always separate** your cow from the other cows just before calving.

**Make sure** she is:

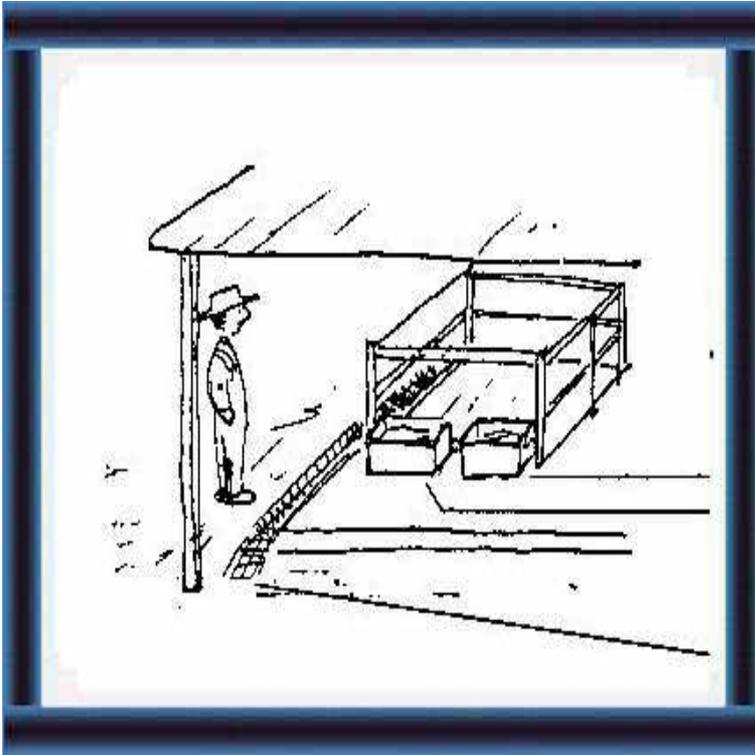
- safe
- quiet.



16 If **outside**, the site should be:

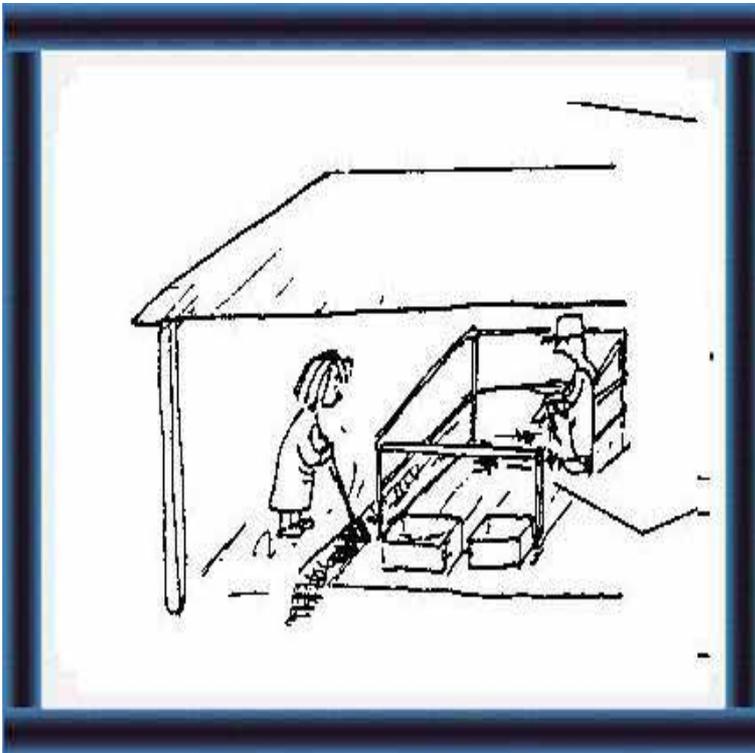
- dry
- fenced
- roofed, e.g. in rainy weather or places with no shade.

**Move dairy cows to the calving site at 270 days pregnancy (about 310 days for dairy buffalo). (19)**



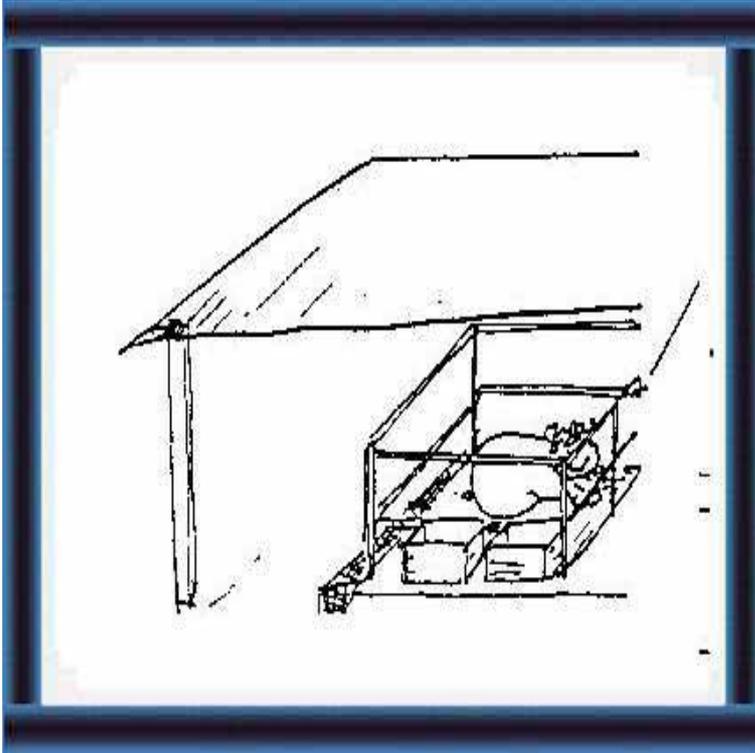
17 If **inside** the barn, prepare a 1.8 x 1.8 m calving box **outside** of which are:

- gutter
- feeder
- waterer.



18 **Before** moving your cow to the box:

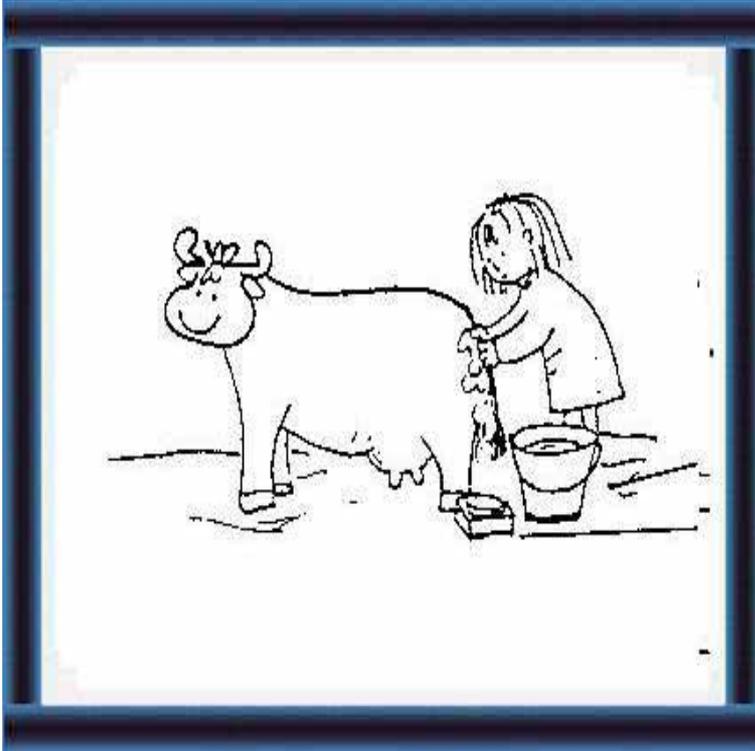
- clean everything
- disinfect everything
- add plenty of straw bedding (if available)
- add sand or sawdust if the floor is slippery.



**19 Move** your dairy cow to the box about **1 week before calving** - about 270 days of pregnancy (310 days for dairy buffalo).

**Note:**

*Consult your breeding calendar or extension worker.*



**Washing**

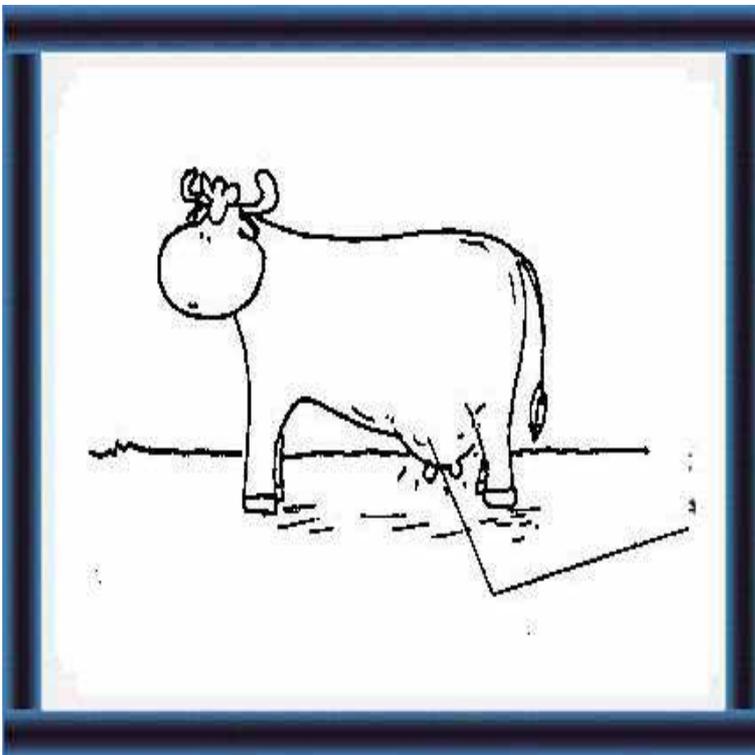
**20 Wash** your cow with soap and water **daily** to prepare for calving.

## Signs of approaching calving

The most important signs of approaching calving:

- The udder grows quickly in the last weeks of pregnancy and begins secreting close to calving; (21)
- The vulva may show swelling and discharge of mucus; (22)
- The hip areas on each side of the tail root "relax". (23)

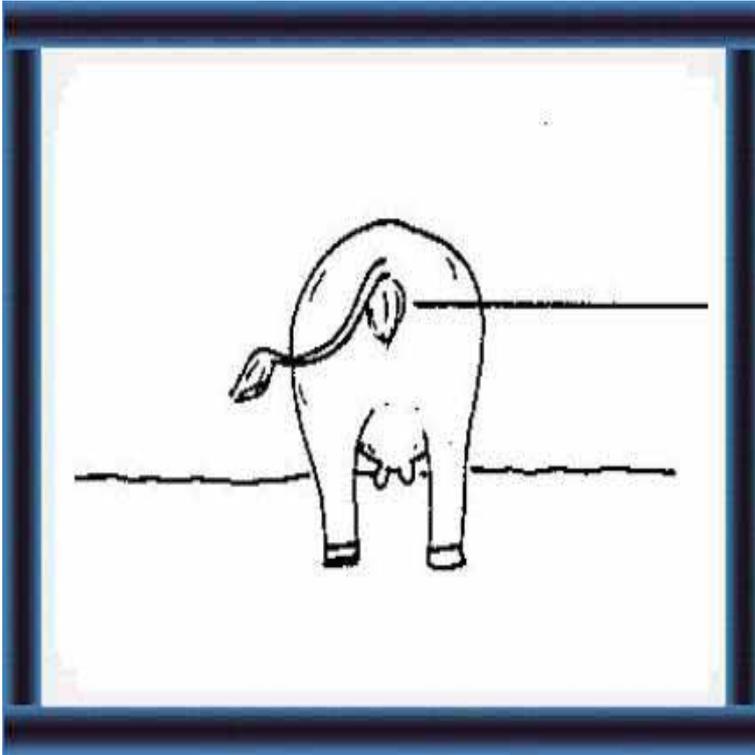
page 172



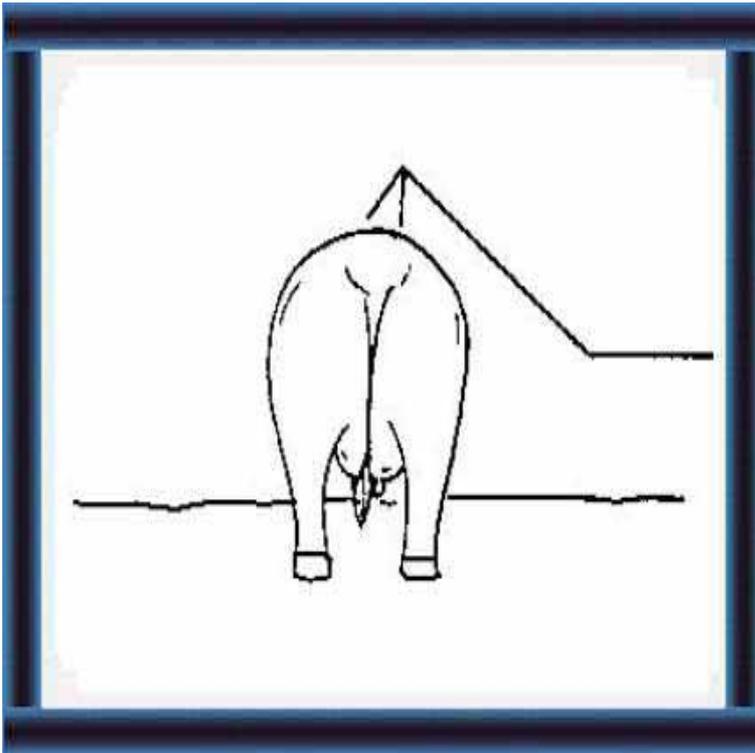
What are the signs of calving?

1-2 weeks before calving

21 The **udder** becomes **bigger** as liquid collects.

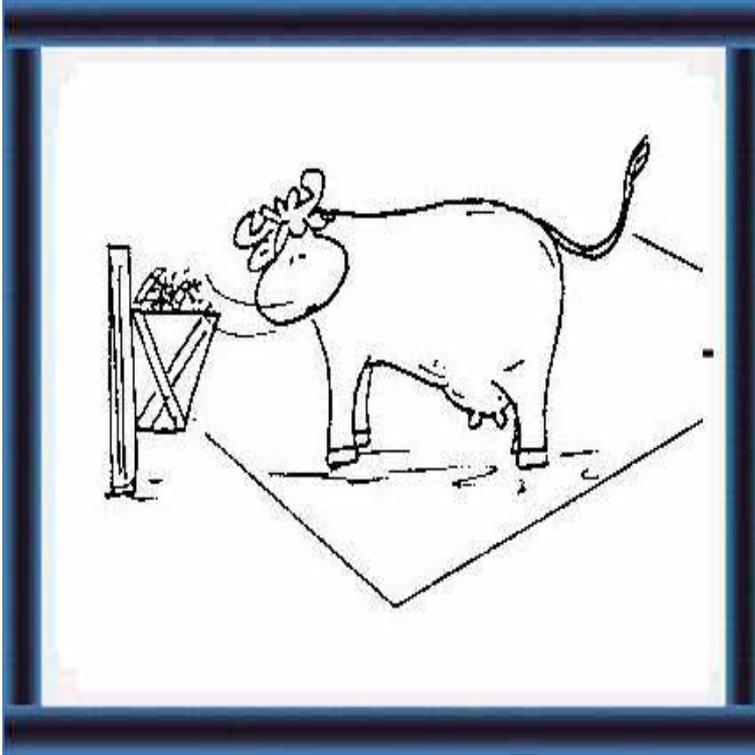


**Near to calving**  
22 The **vulva swells** and begins to **discharge mucus**.



**1-3 days before calving**  
23 The area on each side of the tail **relaxes**.

You can feel the looseness and see the curve - your cow is **preparing for birth**.



24 Your cow may:  
- raise her tail  
- eat less.

page 173

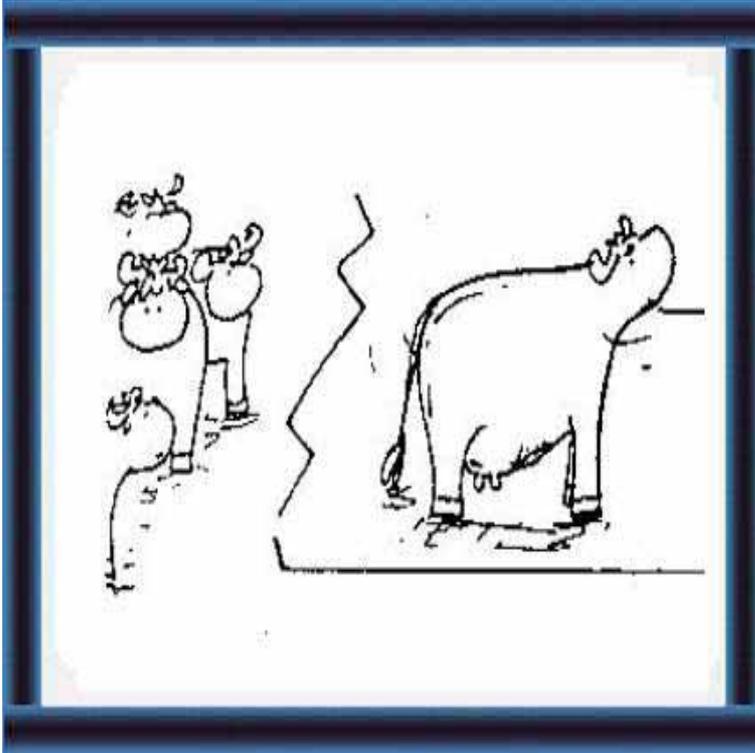
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**At parturition, the cow becomes restless and tries to separate if in a group. (25)**

**She also starts to strain intermittently. Duration of straining increases and intervals between straining shorten as the parturition process continues, with a short pause after the rupture of the water bag. (26)**

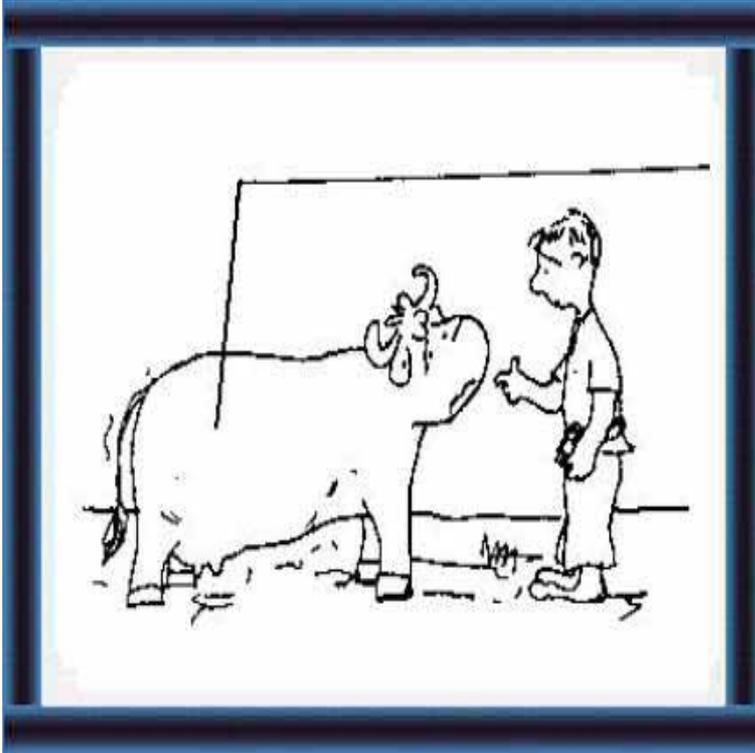
page 174

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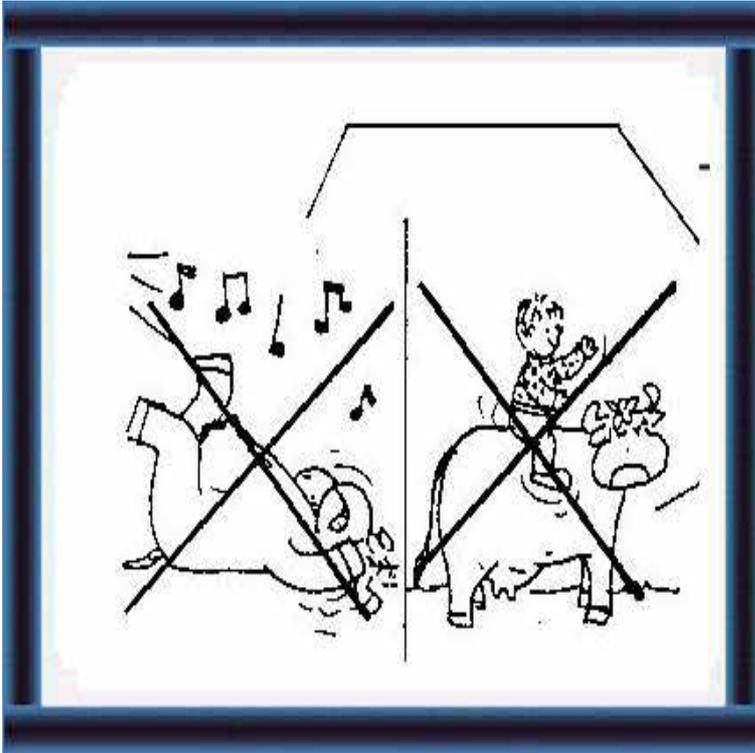
**25 Just before calving**

Your cow becomes **restless** and tries to **separate** from the herd.



**26 Your cow begins to strain (labour) from time to time.**

As calving progresses, she strains **harder** and **more often**.



**27 Make sure:**

- she has **quiet**
- no one disturbs her or she may **hold back her calf**.



**What do you see and do during calving?**

**Normal birth**

- 28 Watch carefully** but do nothing if everything is normal.

# Calving

**The most important thing to remember:**

**OBSERVE THE COW - BUT LEAVE HER ALONE IF CALVING PROCEEDS NORMALLY**

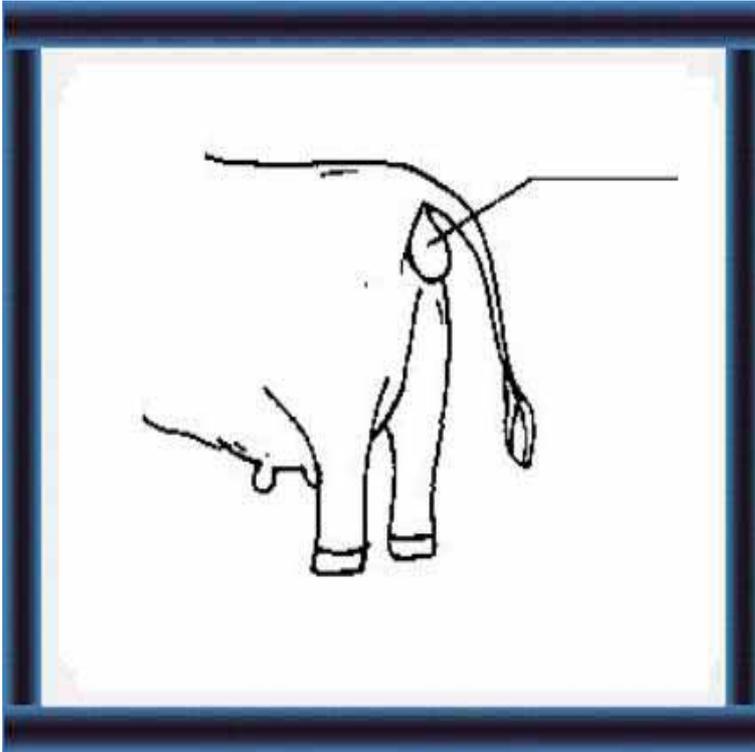
**First, the water bag appears in the vulva opening. It breaks by itself later, so DO NOT BREAK IT! (30)**

**Normally, the head and two front legs then appear in the vulva opening. (31-32)**

page 176



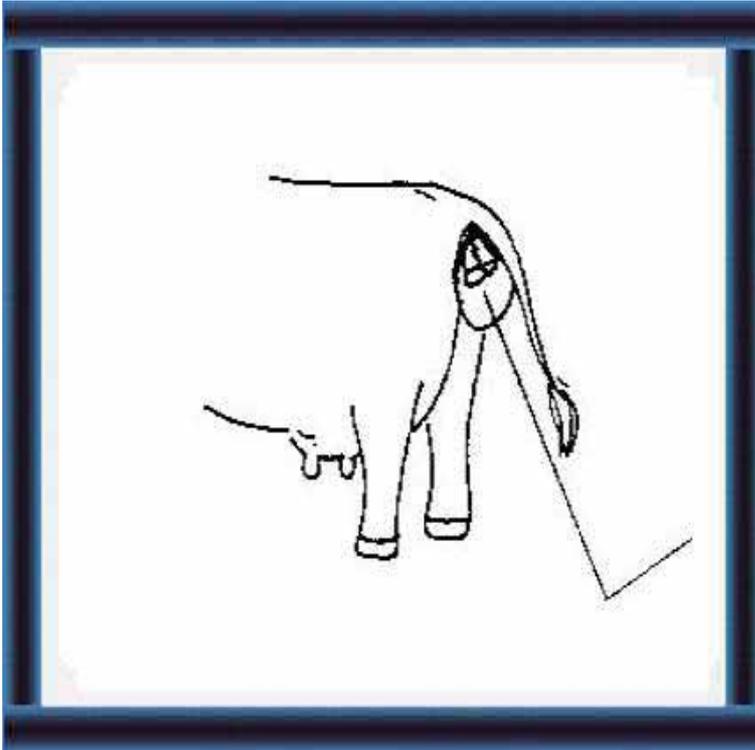
29 **Never** try to **hurry** your cow, you may **hurt** her and your calf.



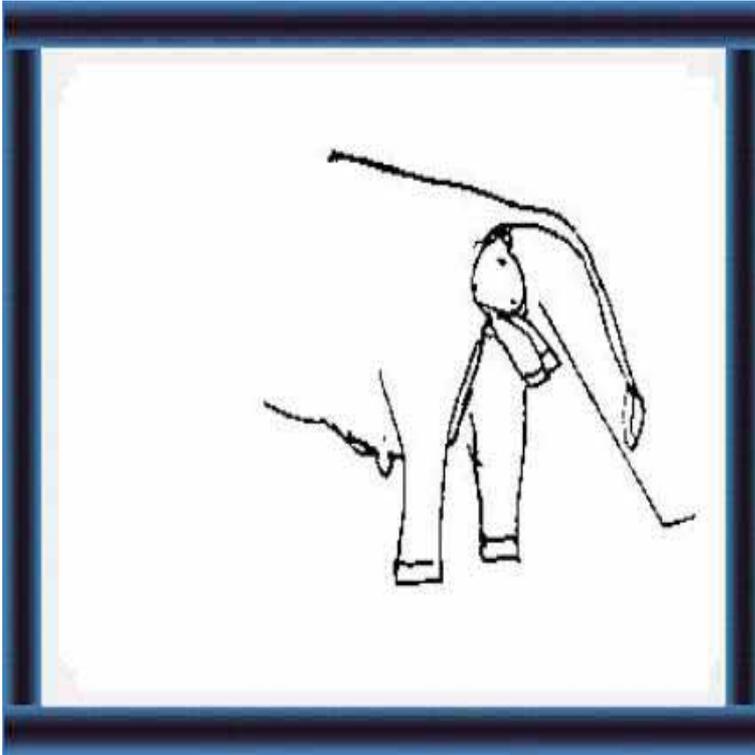
30 You see the **water bag** in the vulva opening.

**Never** break the bag, it breaks by itself.

The straining **stops** for a short time.

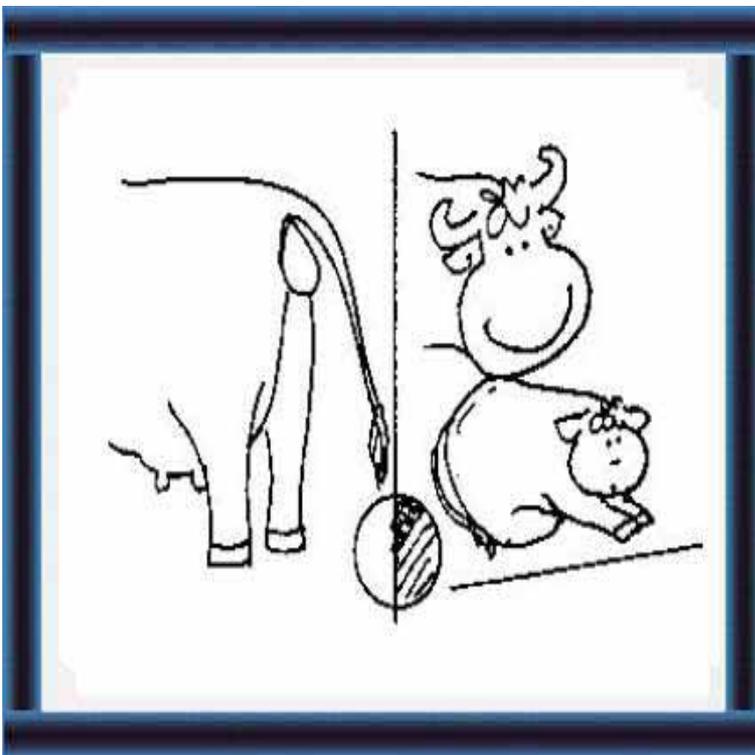


31 Then the straining **begins again**, you see the **two front legs**

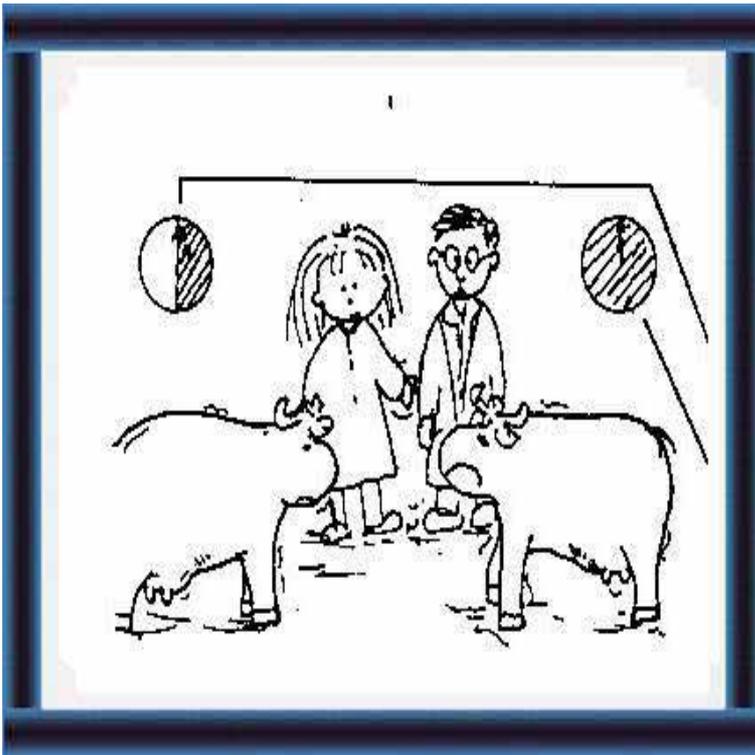


32 .....and then the **head**.

page 177



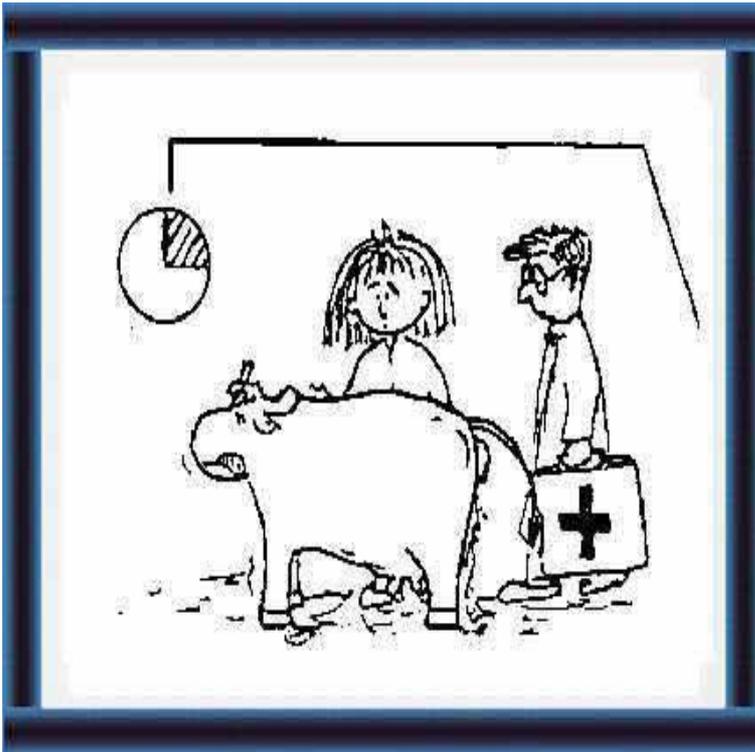
33 Normally, your cow **continues labour for 2-6 hours** while the rest of your calf comes out.



**34 Call the vet if:**

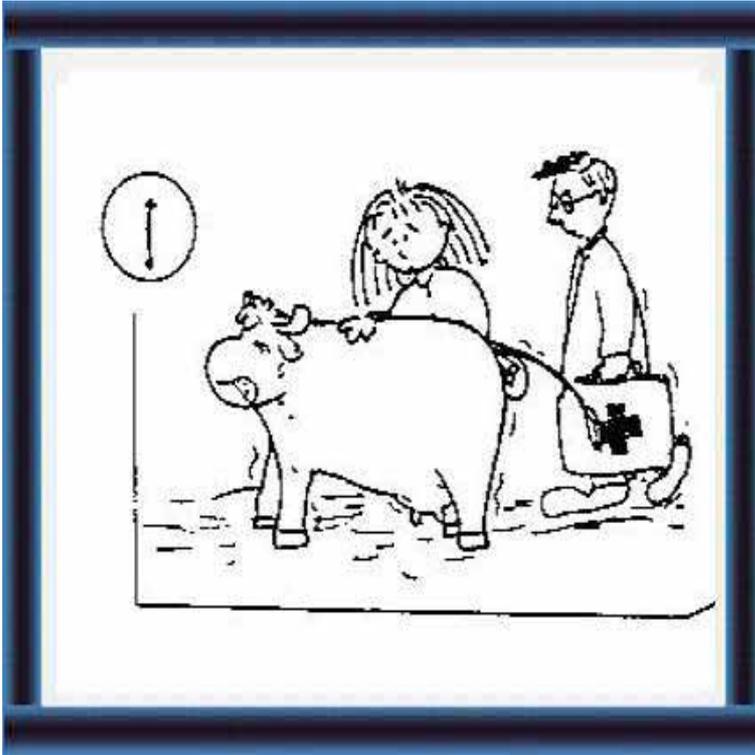
- your animal **starts labour**  
but you do **not** see the water  
bag:

- for cows, in 6 hours
- for heifers, in 12 hours



**35**

- you see the water bag **break**  
but **no part** of your calf after  
2-3 hours



36  
- you see **part** of your calf but  
no more of the calf comes out  
after 30 minutes

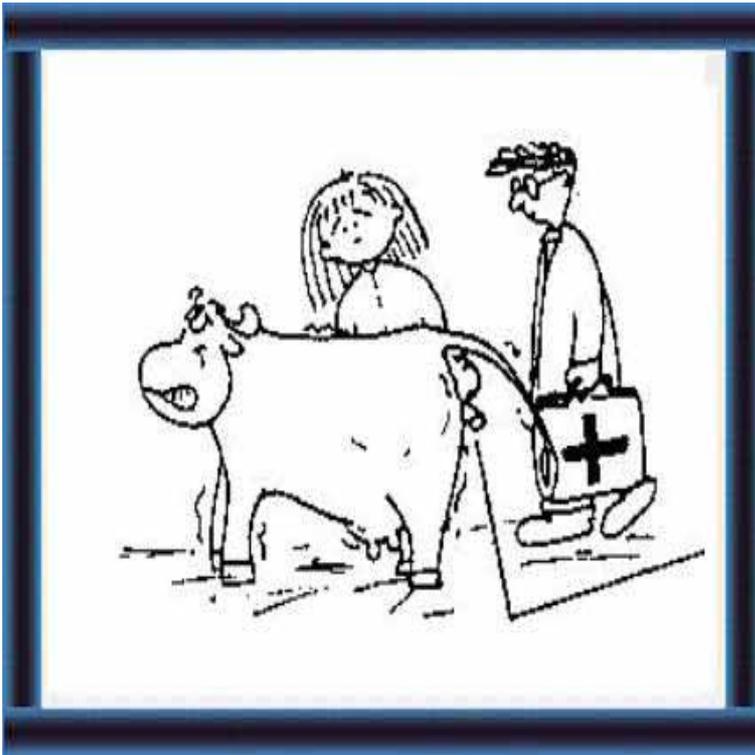
page 178

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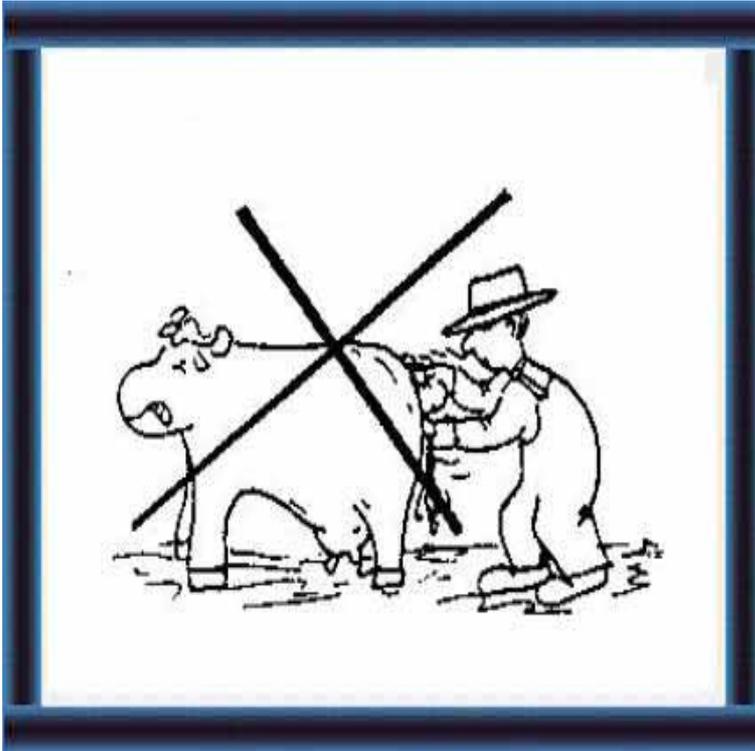
**In most cases the rest of the calf is then soon delivered. If, however, the birth stops at this point the farmer may assist in pulling out the calf. Clean the cow well (vulva surroundings) with water and soap. (39-40)**

page 179

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37 **Call the vet if:**  
- you see the head and **only**  
**one** front leg.



38 **Do not** try to turn the calf  
or pull the other leg out, you  
may **hurt** your cow and your  
calf.



**39 You may help your cow if:**

- the head, two front legs (and maybe the front part of the body) come out **but** no more of the calf comes out with labour.



**40 Clean and disinfect:**

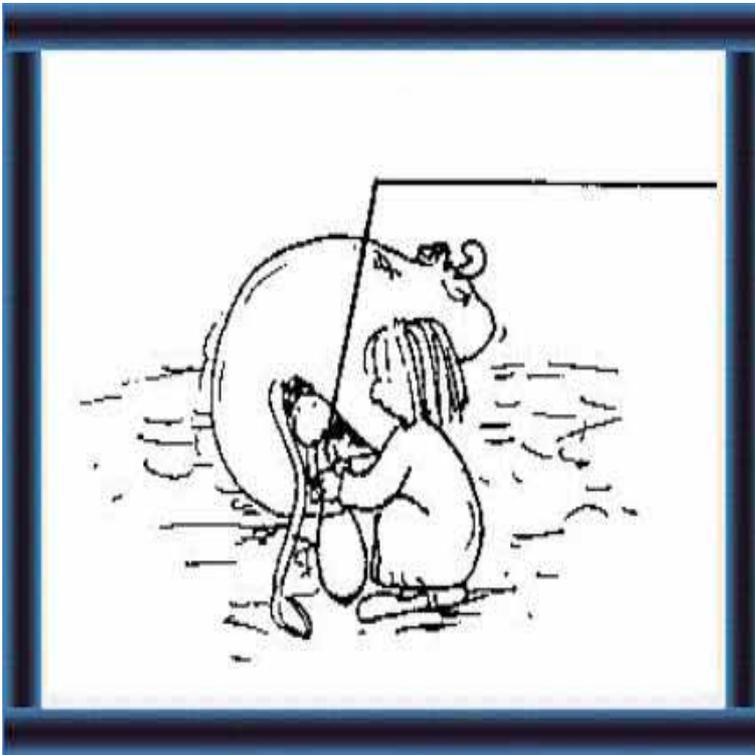
- your hands and arms and make sure your finger nails are short
- the area around the vulva
- the rope or chains
- the stick or torsion bars.

**Place a clean rope or chain around each leg of the calf at a point higher than the pastern joints. (41-42)**

**Pull by using a strong, clean stick as a torsion bar. (43)**

**Pulling should be out and down. NEVER UP! Pull at the time the cow strains and not during the intervals between strainings. Not more than two persons should pull. If excess force is used, the uterus will also come out with the calf or it may tear. (44)**

page 181



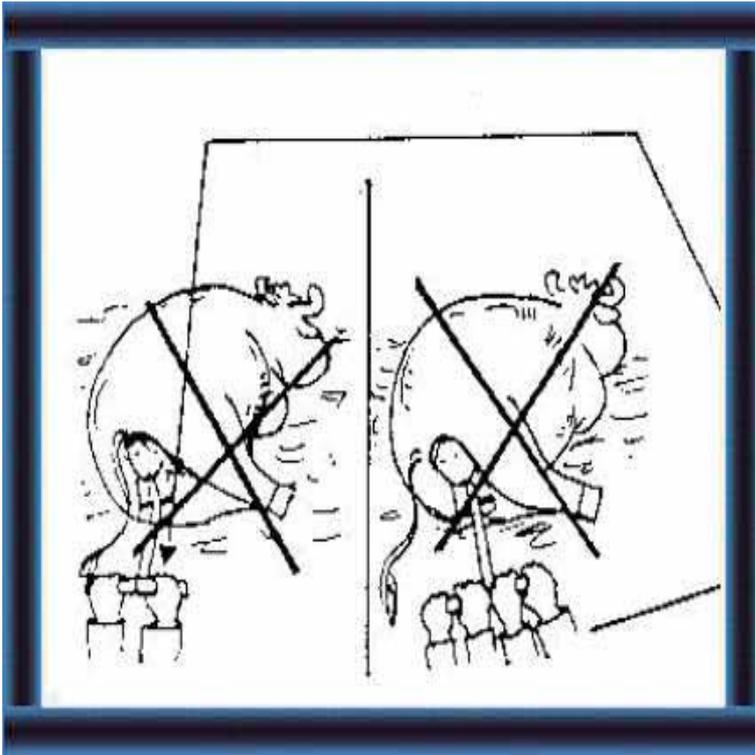
41 **Carefully** tie each end of the chain or rope **above** the hoof joints of the calf.



42 Put the stick or torsion bars through the loop of the rope or chain.



43 **Pull:**  
- **only** when your cow **strains**  
- **only** towards your cows's **udder**  
**udder**  
- **only** with **one other** person.



**44 Never pull:**  
- straight or upwards  
- with more than one other person.

page 182

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**If no progress is seen: call the veterinarian. The veterinarian should also be called when: (45)**

- the cow has shown restlessness/labour for 3-6 hours (heifer: 12 hours), but no water bag or calf appears;
- the water bag breaks, but the calf does not appear after 2-3 hours;
- part of the calf appears, but there is no progress in birth for about half an hour.

page 183

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45 If pulling **correctly** does not help:

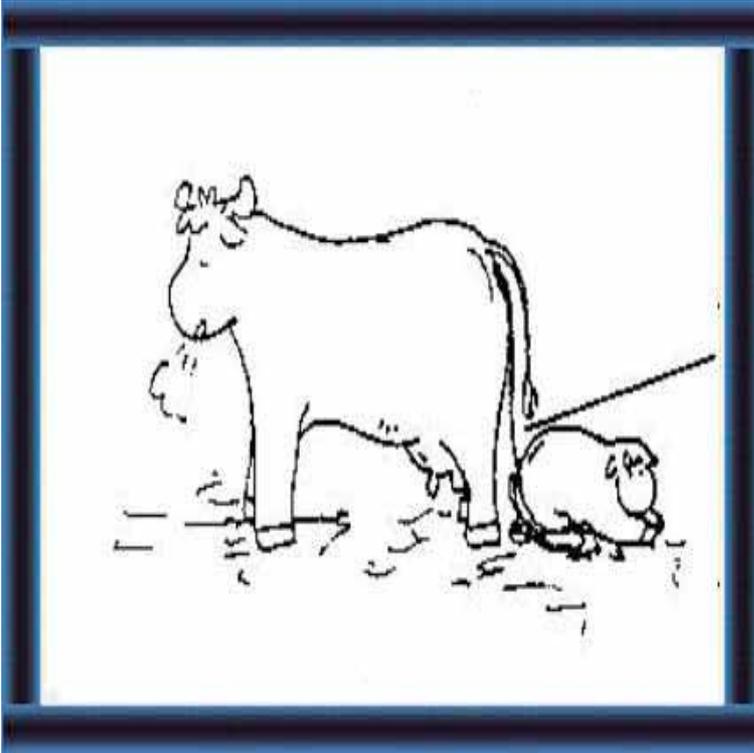
- your cow may have **twins**
- the calf may be **too big** or **deformed**.

**You must call the vet.**



**What do you do after calving?**

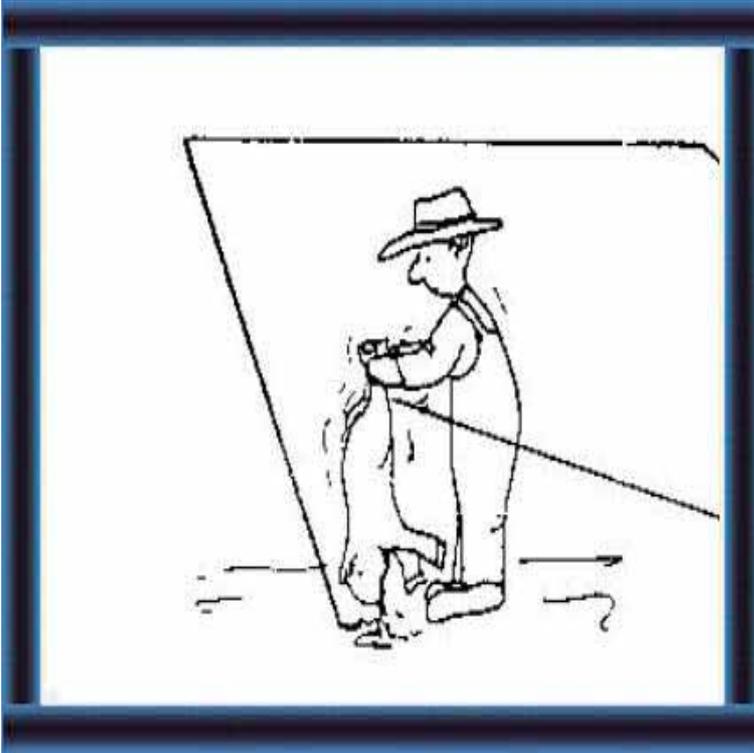
46 After calving you should **care for** your calf and your cow.



**Caring for your calf**

47 **Do not** cut the navel cord.

Your calf receives blood from the placenta.



48 **Remove** liquid from the lungs by:  
- holding your calf by the hindlegs and swinging or shaking

## After calving

### The calf:

**Remove mucus from the mouth and nostrils. If the birth was difficult, hang the calf, head down, over a divider or likewise to let fluid run out of the lungs. (49)**

**Start missing respiration by tickling the nostrils with a straw, by rubbing the chest area thoroughly with some straw or grass or even a piece of rough cloth (52) or by using artificial respiration, alternately pressing and relaxing slowly the calf's shoulder and front leg. (53)**

page 185



49

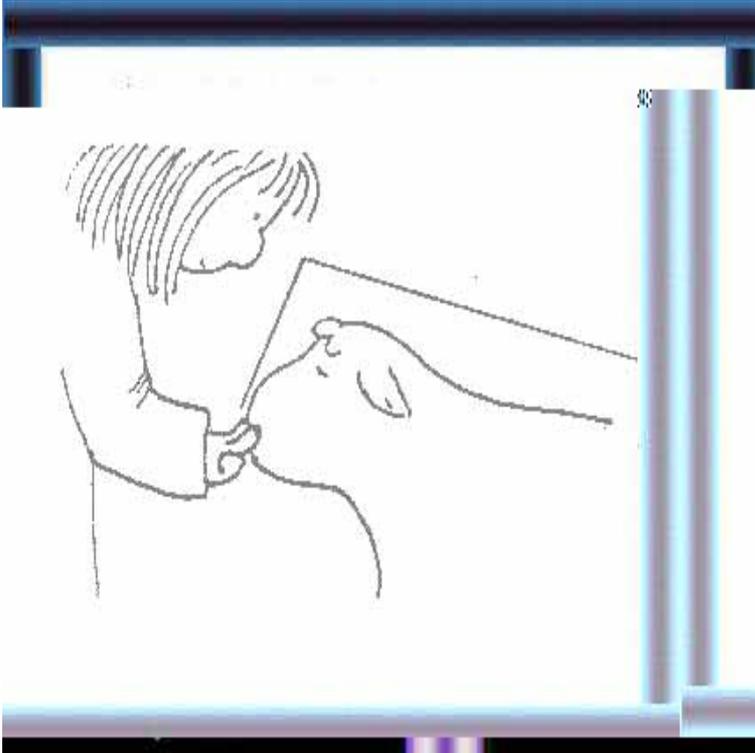
- hanging your calf over a board and **rubbing firmly**.

Rub from the stomach to the chest to the throat.

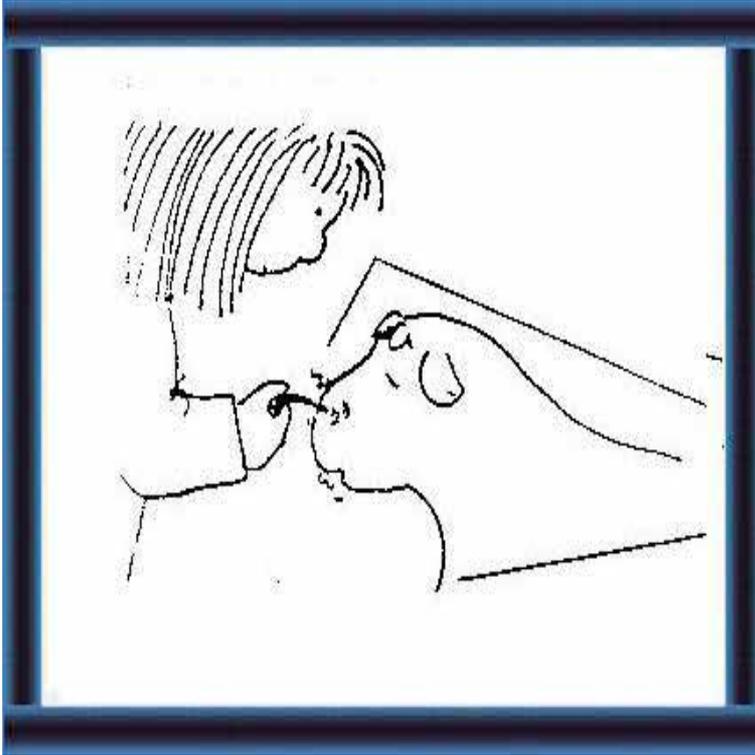


50 Put your calf down.

Put your hand in the back of your calf's mouth and **wipe out the mucus.**



51 Use two fingers to milk (wipe) out mucus from your calf's nose.



52 If your calf is **not breathing:**  
- **tickle** the **nose** with a clean straw  
- **gently rub** the **chest** with some straw or rough cloth

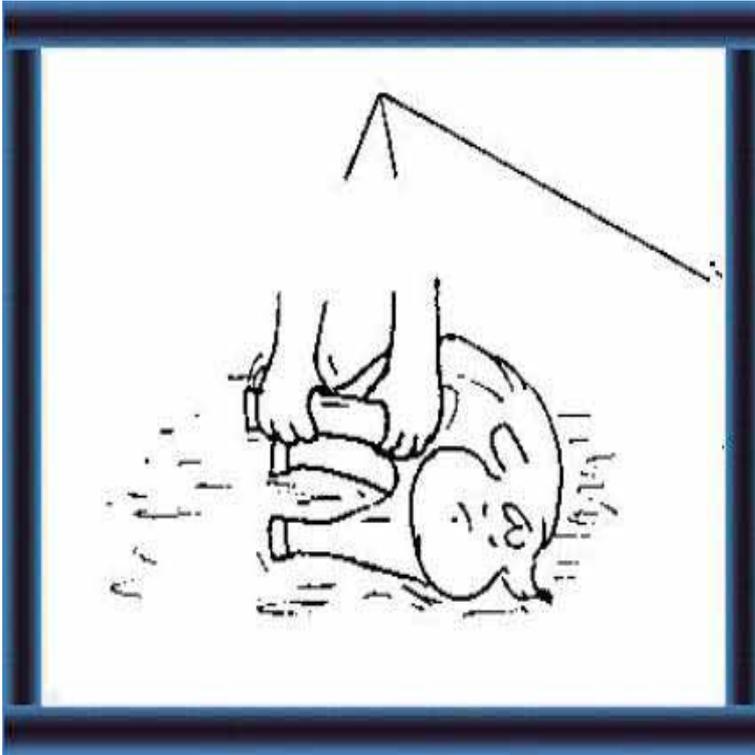
page 186

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**Dry the calf (or allow the cow to clean it by licking). (55-56)**

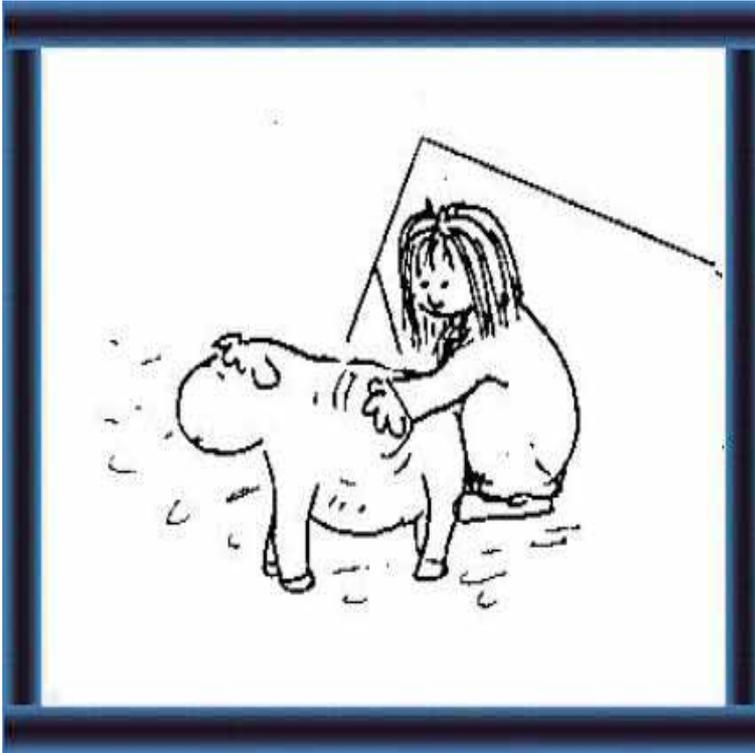
page 187

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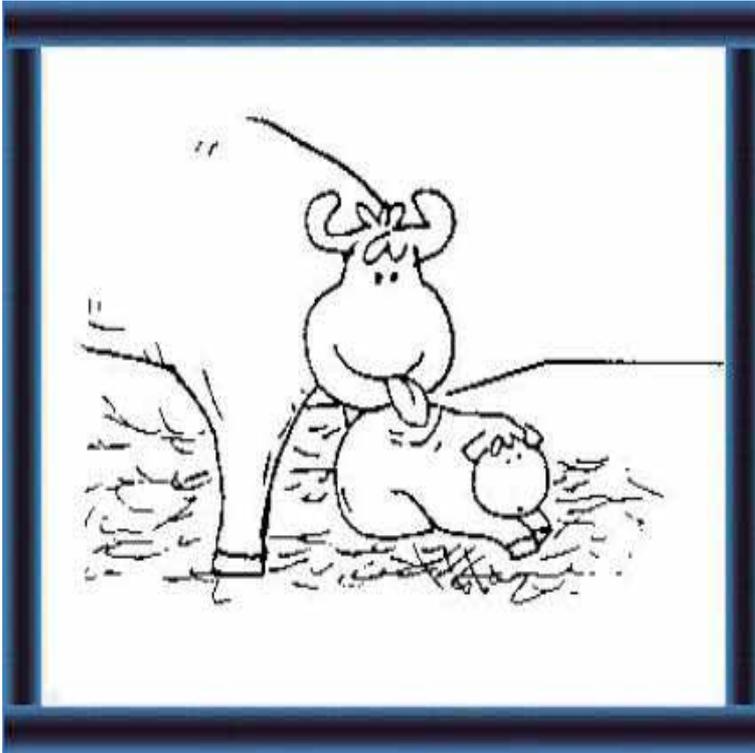
53

- hold your calf's front leg and shoulder and **alternately press and relax**

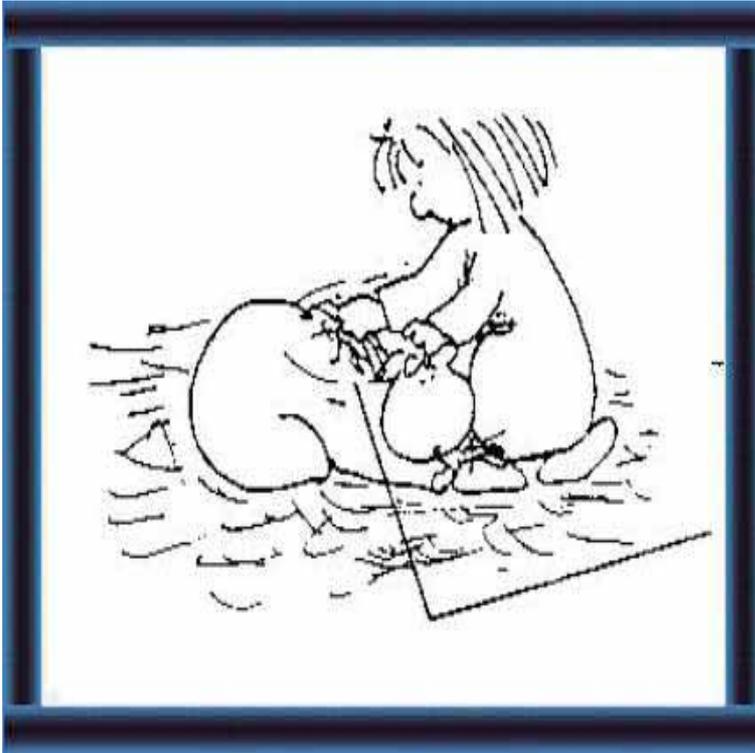


54

- **slap** your calf on the **ribs** or on the **rump**.



55 Give your calf **fresh air** and let your **cow lick the calf dry** as soon as possible.



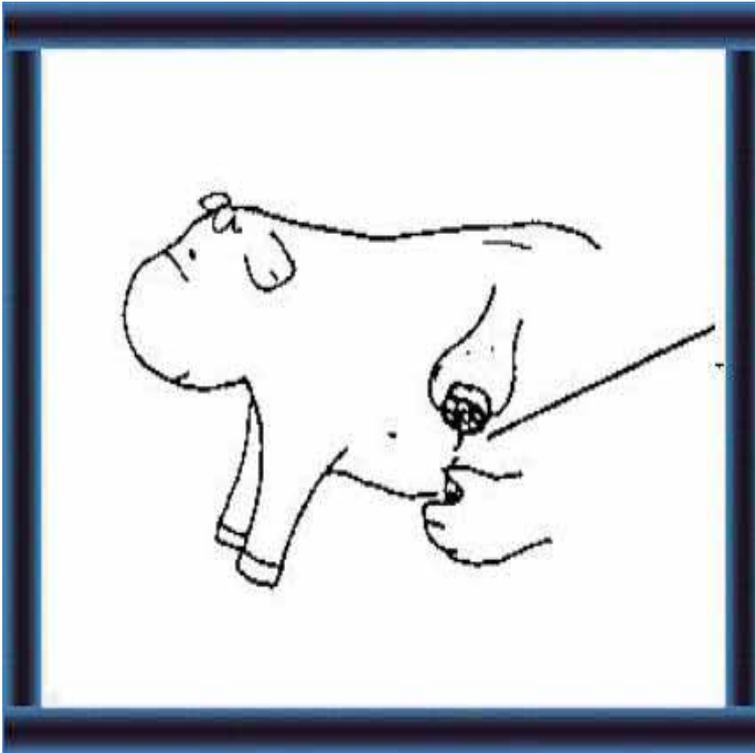
56 If your cow cannot lick the calf, **use straw to rub the calf dry**.

**Dip the navel cord in tincture of iodine (do not cut the cord!). Apply an antiseptic dressing three times a day during the first 3 days. This helps healing. (57)**

**Give at least 1 litre of colostrum within 2 hours after birth, and another 2 litres within 6 hours (or encourage the calf to drink colostrum as soon as possible, within the first hour). (59)**

**If suckling is practised, encourage the calf to suckle at least four times during the first 24 hours (and remove surplus colostrum by hand milking). Suckling stimulates uterine activity and helps in expulsion of after birth.**

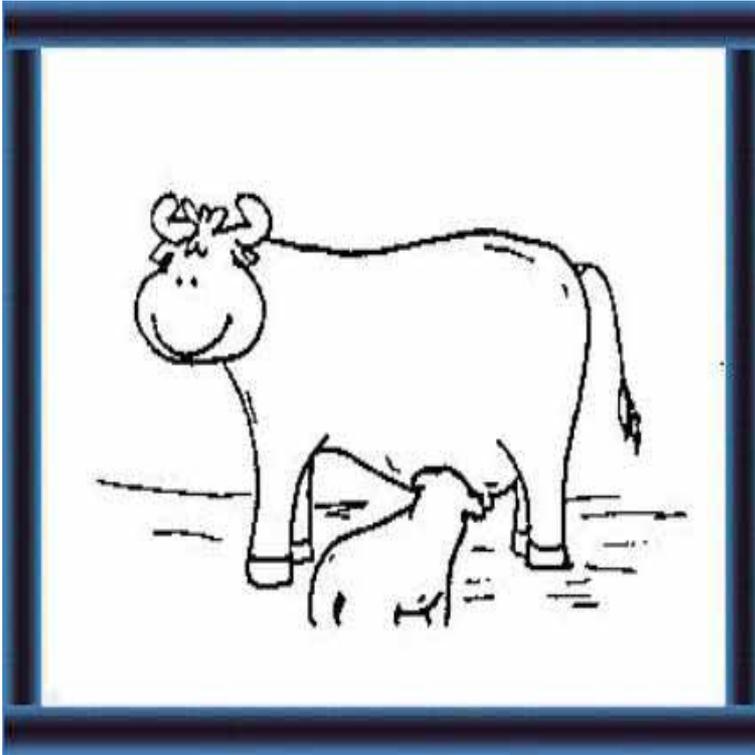
page 189



57 Dip the **navel cord** in **tincture of iodine**.

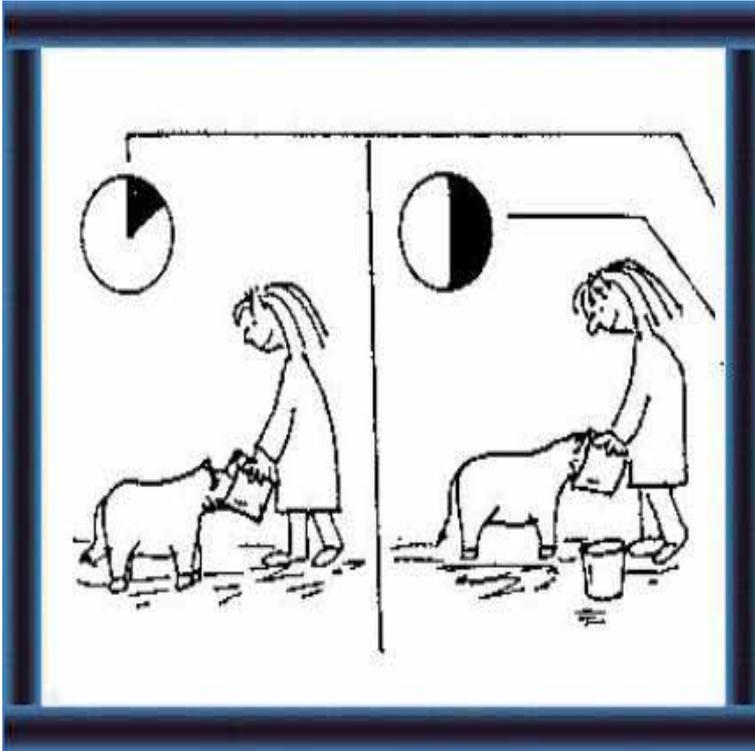
**Do not** cut the cord.

Check **daily** for navel infections at least 2 weeks after calving.

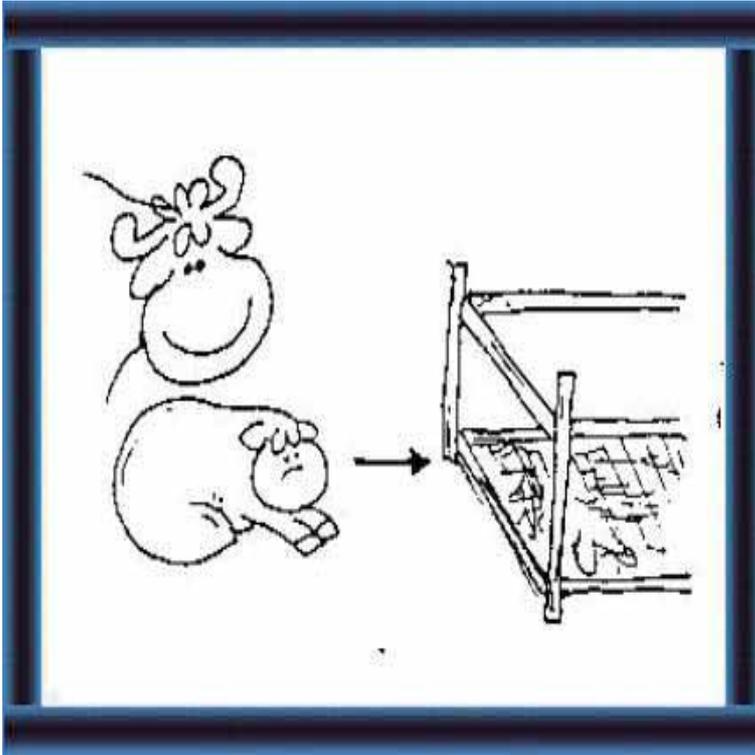


58 Allow your calf to get **colostrum** by **suckling**.

(See H.9 Calf Rearing for more information on calf care)



59 **Make sure** your calf gets:  
- **at least 1 l** of colostrum within 2 hours of birth  
- **2 more l** of colostrum within 6 hours of birth.



60 Move your calf to a separate calf box.

page 190

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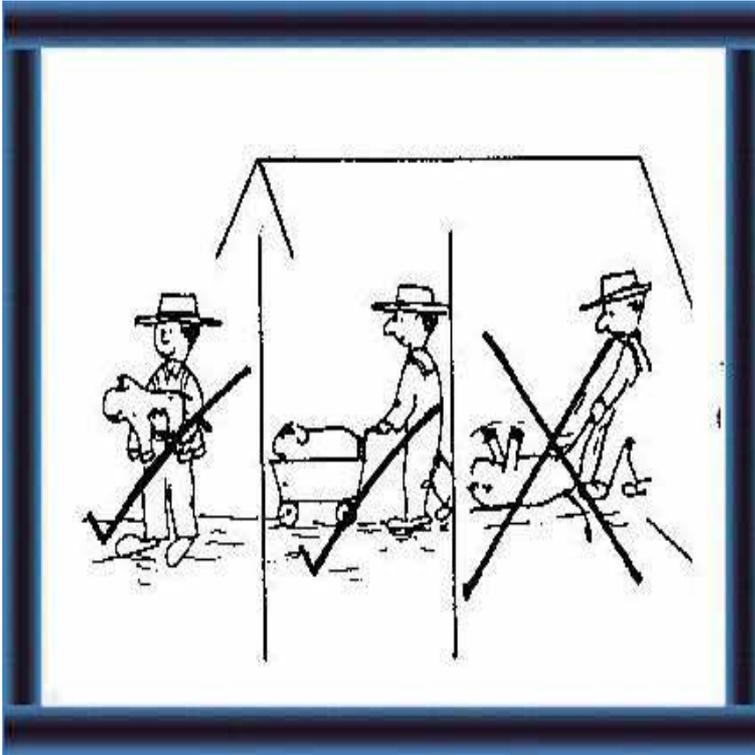
**Place the calf in a clean, draught-free box with a lot of dry bedding. (62)**

**The cow:**

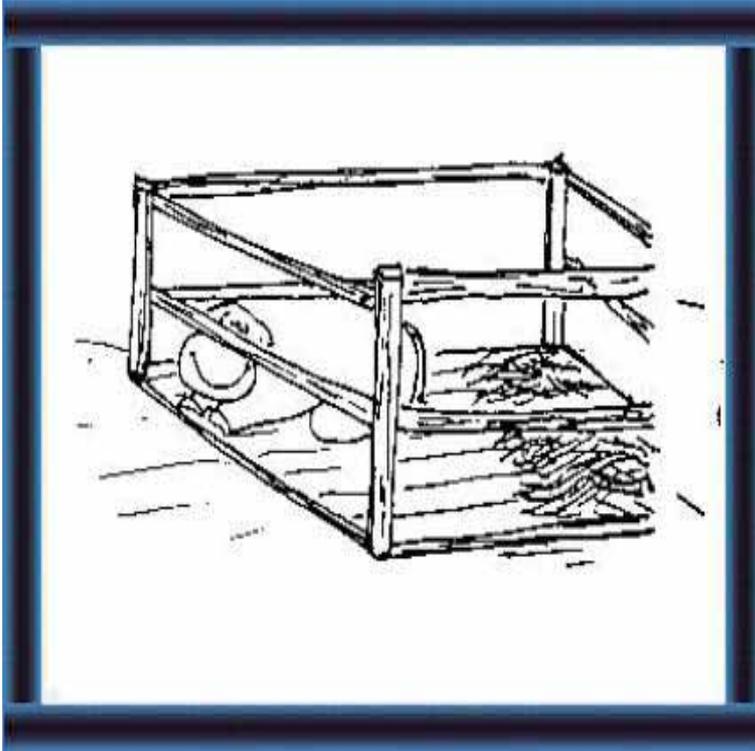
**Make sure the cow stands up within an hour after calving. Keeping the calf in front may encourage her to get up. (64)**

page 191

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61 **Carry your calf or use a wheel-barrow.**



**Do not** drag your calf along the floor.

62 **Make sure** the calf box:

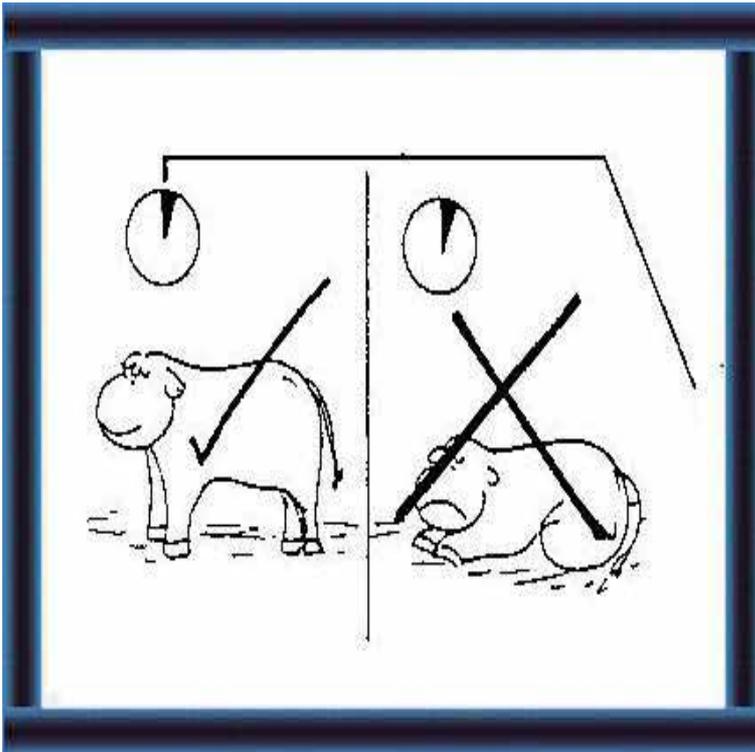
- is clean
- is dry
- is free from draughts
- has lots of dry bedding.



### Caring for your cow

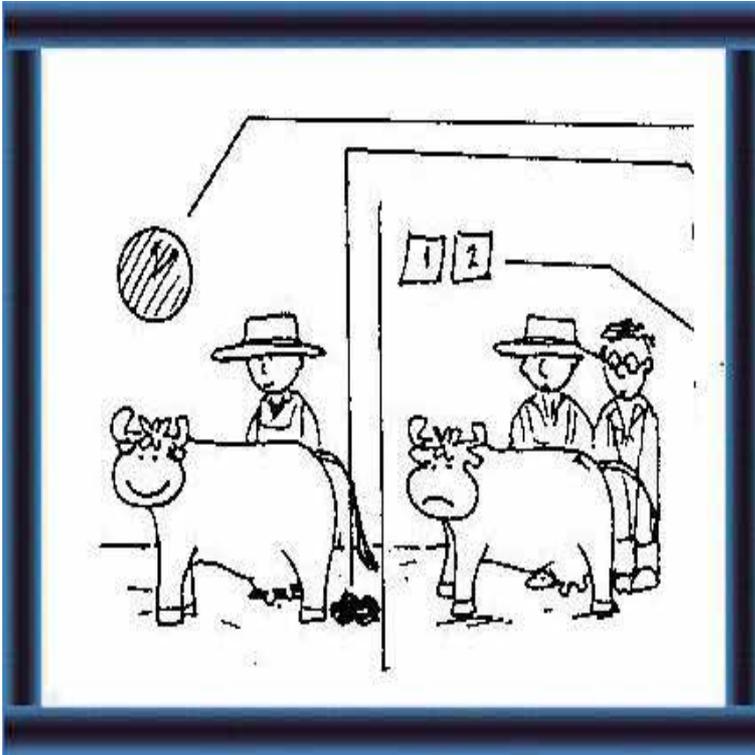
63 Keep your cow in a place which is:

- clean
- dry
- warm and free from draughts.



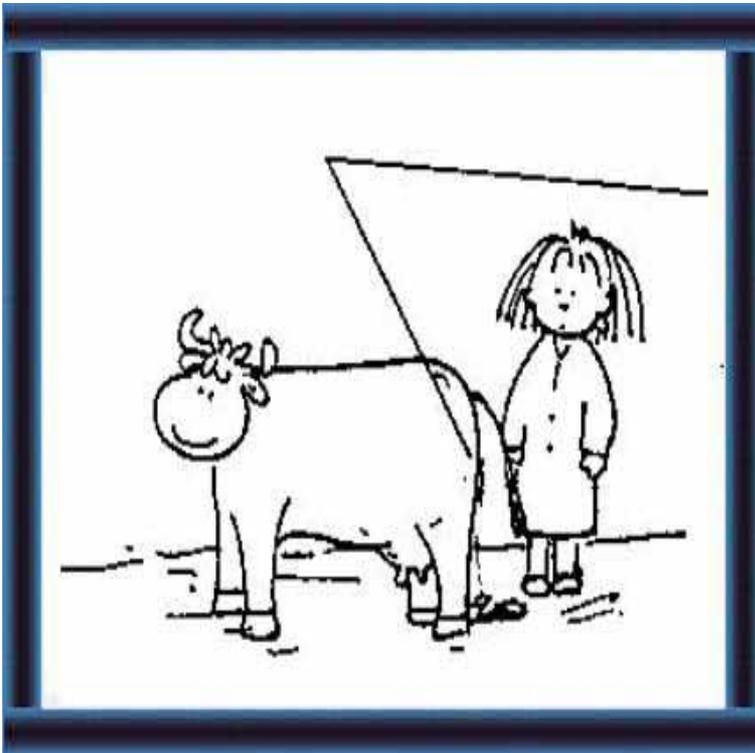
64 Make your cow stand up **within 1 hour** after calving, even if she does not want to.

**The cow should deliver the afterbirth within 24 hours after calving. If there is no afterbirth within 24 hours call a veterinarian for examination. (65)**



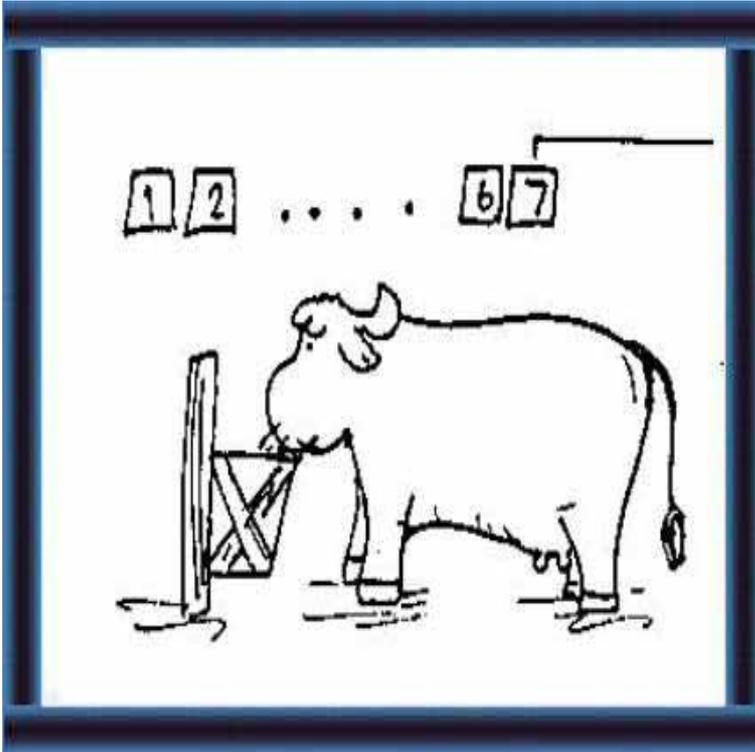
65 Your cow should deliver the **placenta** within **12 hours** after calving.

If there is no placenta after 24 hours, **call the vet.**



66 A reddish discharge from the vulva is **normal** for 2 weeks after calving.

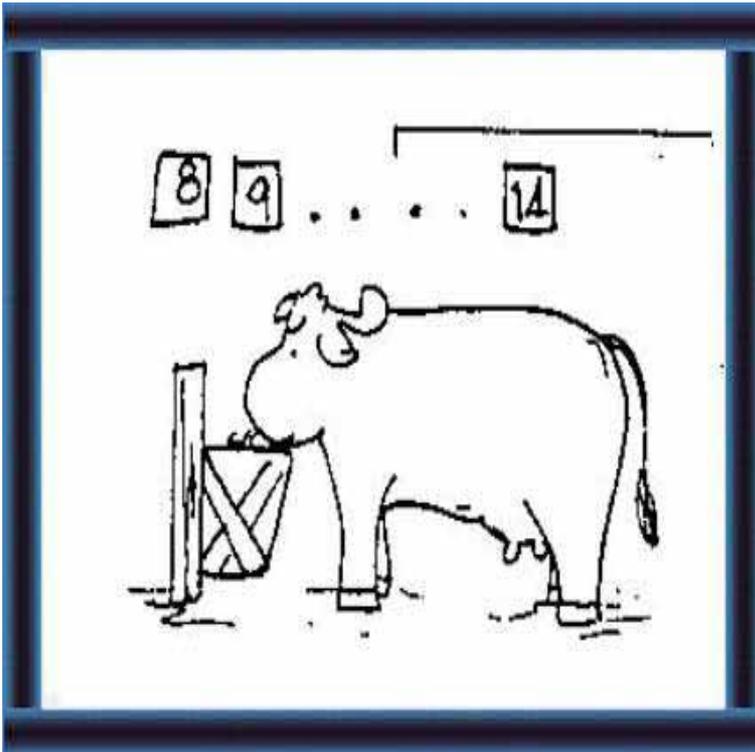
After 2 weeks, the discharge should become clear and then stop.



67 For the **1st week** after calving, feed your cow mainly foods which are:

- light
- bulky
- slightly laxative

e.g. bran and molasses with little silage or grain.



68 After the 1st week, **slowly** increase the amounts of grain and silage in your cow's diet.

**What do you know about calving?**

<b>Preparation for calving</b>	<b>Signs of calving</b>
<b>Before estimated calving date:</b>	<b>Before estimated calving date:</b>
<b>2 months - dry off your cow</b>	<b>(9) 1-2 weeks - udder increases in size (21)</b>
<b>1 month - increase rations</b>	<b>(10-12) 1 week - vulva swells (22)</b>
<b>1 week - prepare equipment</b>	<b>(13-14) - mucus discharge</b>
<b>- prepare calving site</b>	<b>(15-18) 1-3 days - tail area relaxes (23)</b>
<b>- move your cow</b>	<b>(19) - cow raises tail, eats less (24)</b>
<b>- wash your cow daily</b>	<b>(20) Just before - restlessness (25)</b>
	<b>- separation from herd</b>
	<b>- straining (26)</b>

**Care during calving**

<b>1 Normal birth:</b>	<b>- observe carefully (28-33)</b>
	<b>- do nothing</b>
<b>2 Call vet if:</b>	<b>- no water bag within 6 hours of first straining (cows: 6 hours, heifers: 12 hours) (34)</b>
	<b>- water bag but no calf after 2-3 hours (35)</b>
	<b>- calf stuck more than 30 minutes (36)</b>
	<b>- head and only one leg (37)</b>
<b>3 Pull calf if</b>	<b>calf comes out normally but then stuck (39-45)</b>
<b>4 Clean and disinfect you, your cow and all equipment</b>	<b>(40)</b>

**Care after calving**

<b>1 Your calf:</b>	<b>- care of navel cord (47, 57)</b>
	<b>- remove liquid from lungs, mouth and nose (48, 50, 51)</b>
	<b>- help breathing by tickling and rubbing (49, 52-54)</b>
	<b>- clean and dry body (55-56)</b>
	<b>- feeding (58-59)</b>
	<b>- move to calf box carefully (60-62)</b>

<b>2 Your cow:</b>	<b>- housing</b>	<b>(63)</b>
	<b>- standing up within 1 hour of calving</b>	<b>(64)</b>
	<b>- delivery of placenta</b>	<b>(65)</b>
	<b>- vulva discharge</b>	<b>(66)</b>
	<b>- feeding</b>	<b>(67-68)</b>





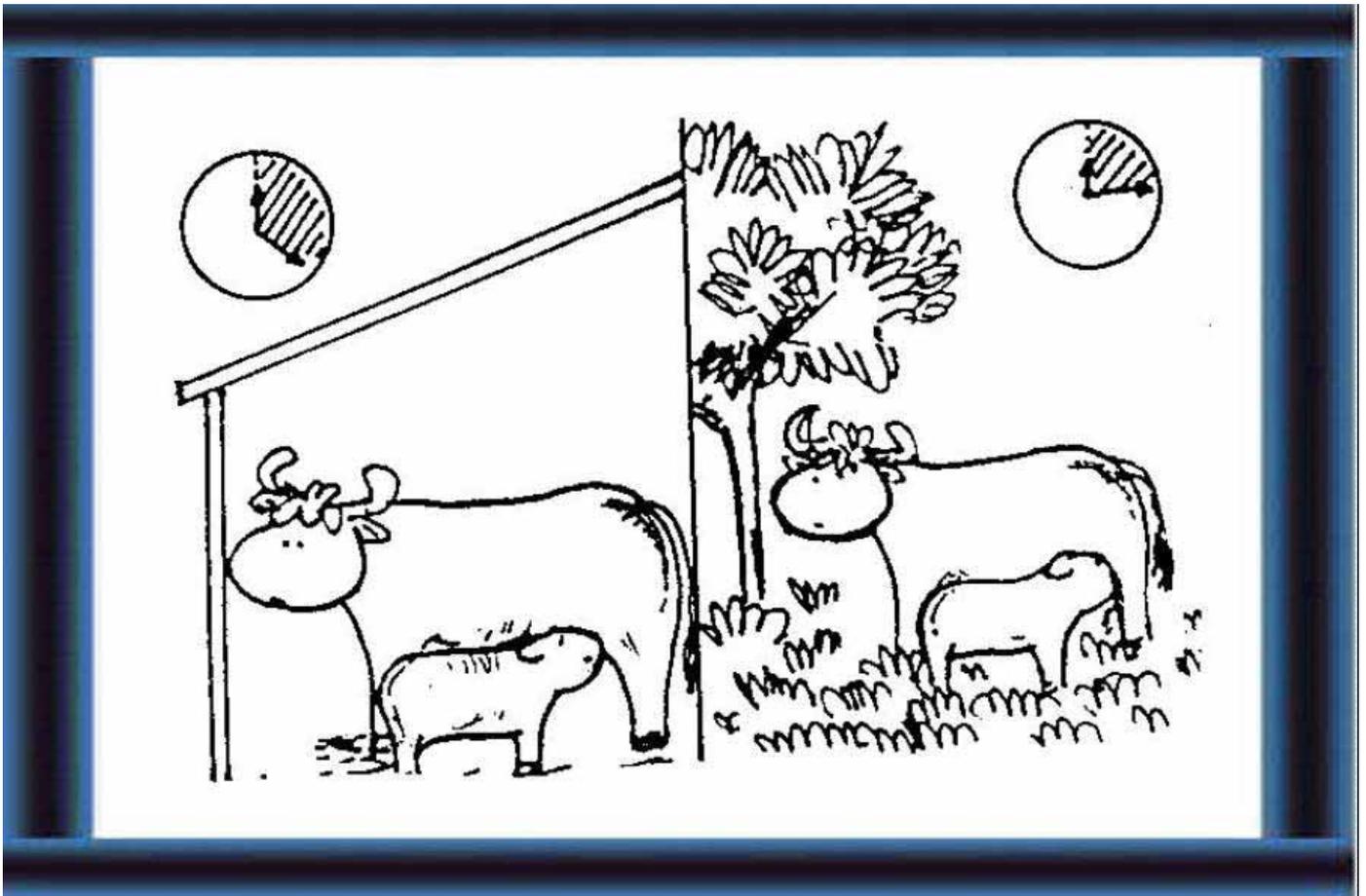
# Small-Scale Dairy Farming Manual

## Volume 4

### Husbandry Unit 9

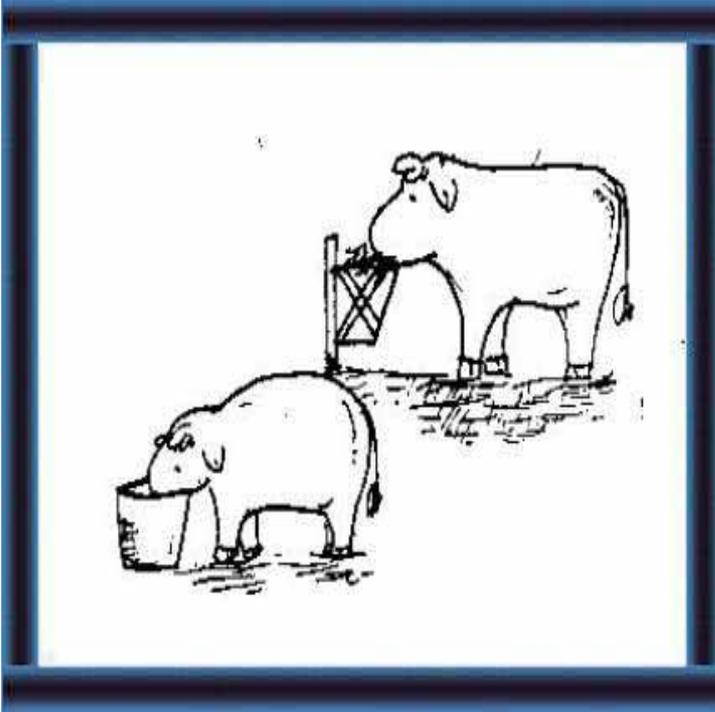
# CALF REARING

page 197



# Extension Materials

What should you know about calf rearing?



**How do you feed your calves?(6-33)**

1 Feeding the **right rations**:

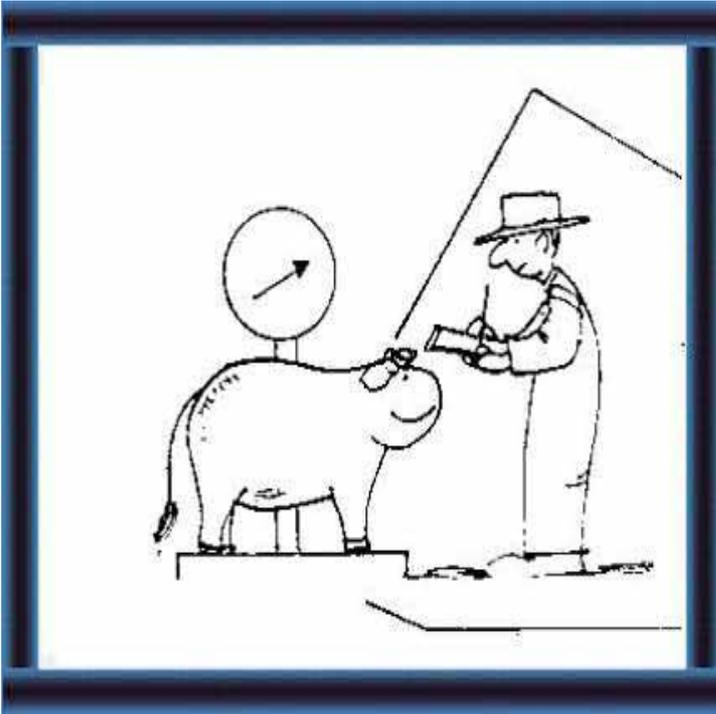
- from birth to weaning
- during weaning
- after weaning.



**What are the main health problems?(34-53)**

2 You should know about:

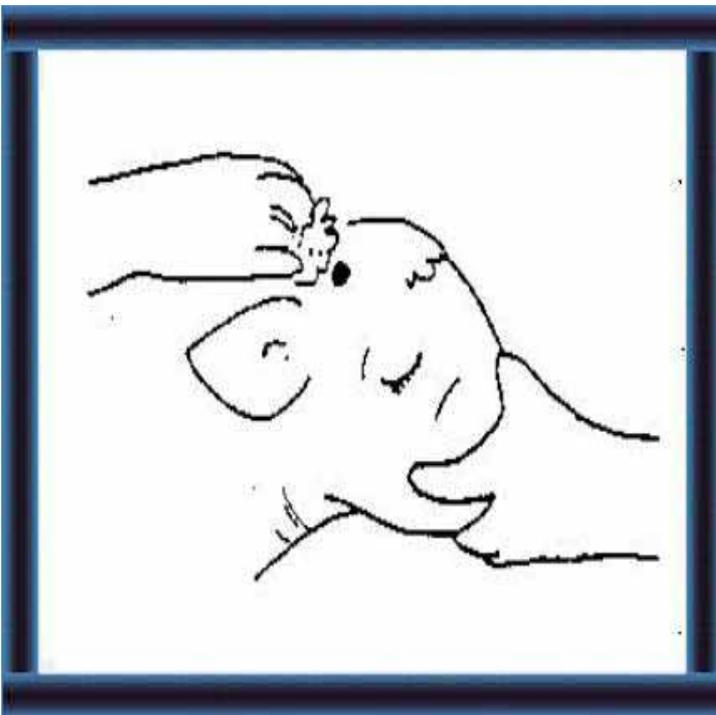
- non-infectious diseases
- bacteria and viruses
- parasites.



**How can you keep records of growth?(54-56)**

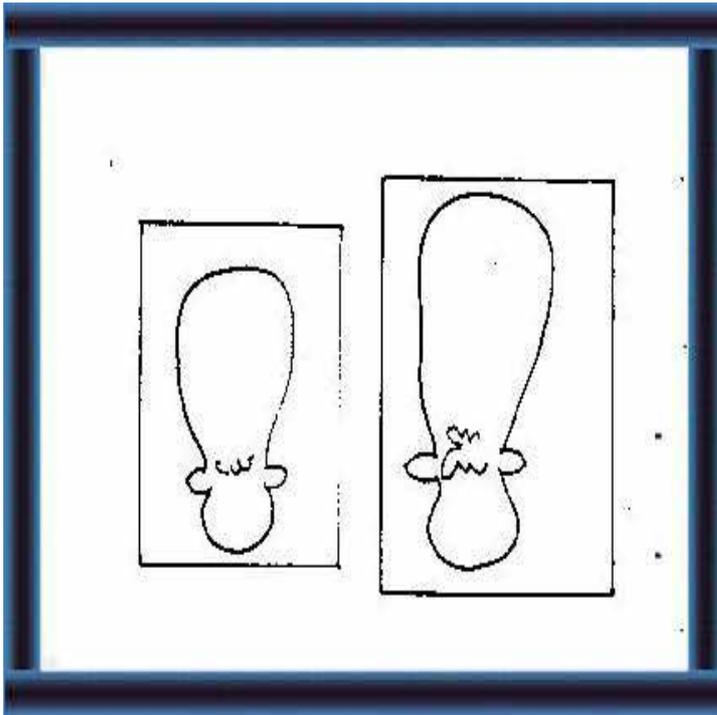
- 3 Good records need:
- ear tagging
  - weighing and measuring.

page 199



**How can you dehorn your calf? (57-59)**

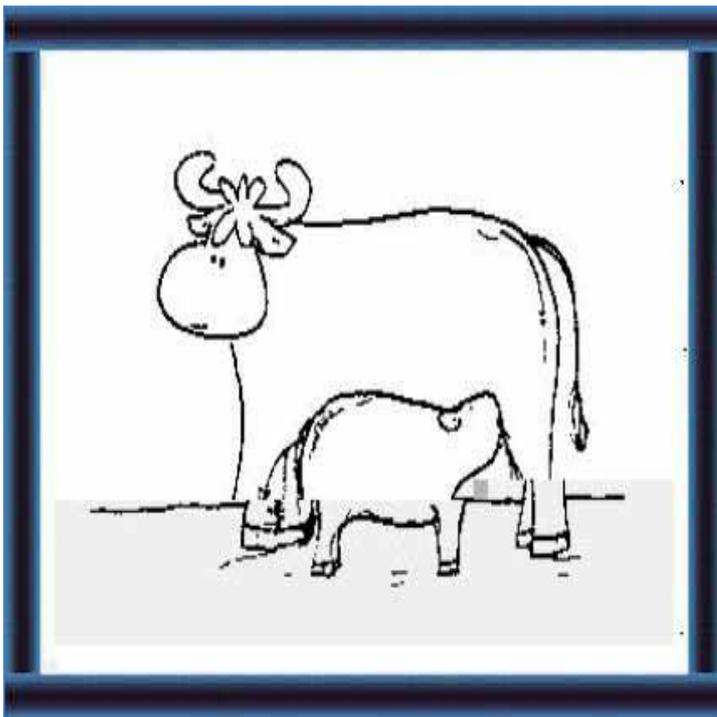
- 4 You should know how to:
- prepare the area
  - apply the chemical.



### What is important in housing? (60-76)

5 Important things in housing include:

- materials
- design
- feeders and waterers.

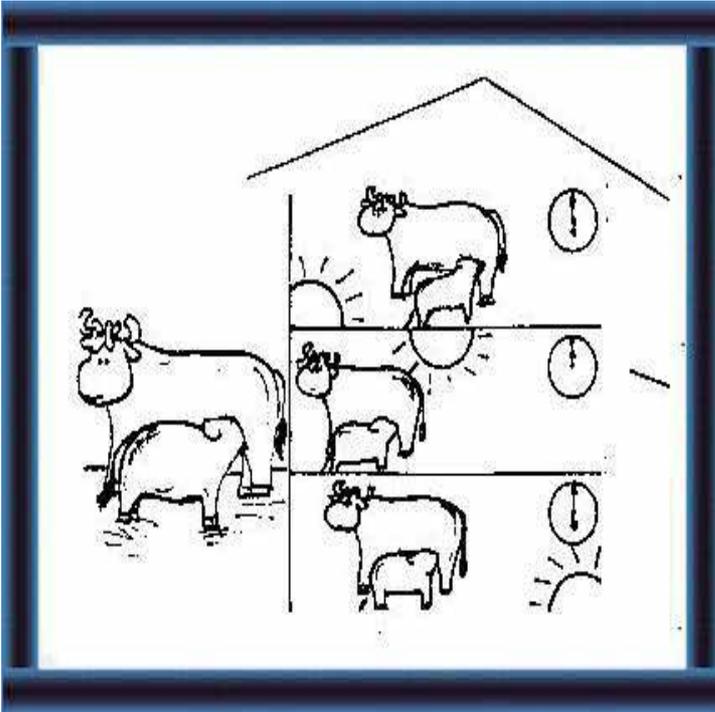


### How do you feed your calves from birth to weaning?

#### Week 1

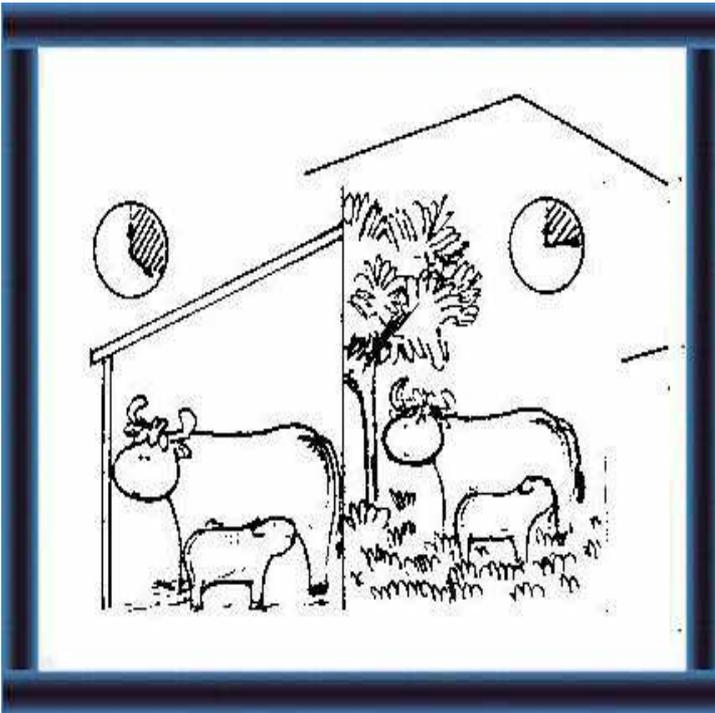
6 After birth, your calf needs **colostrum** for **at least 4 days**:

- for **nutrients**
- for **protection** against **disease**
- for **passing faeces** the first day.



7 If you do **not** separate your calf and dam:

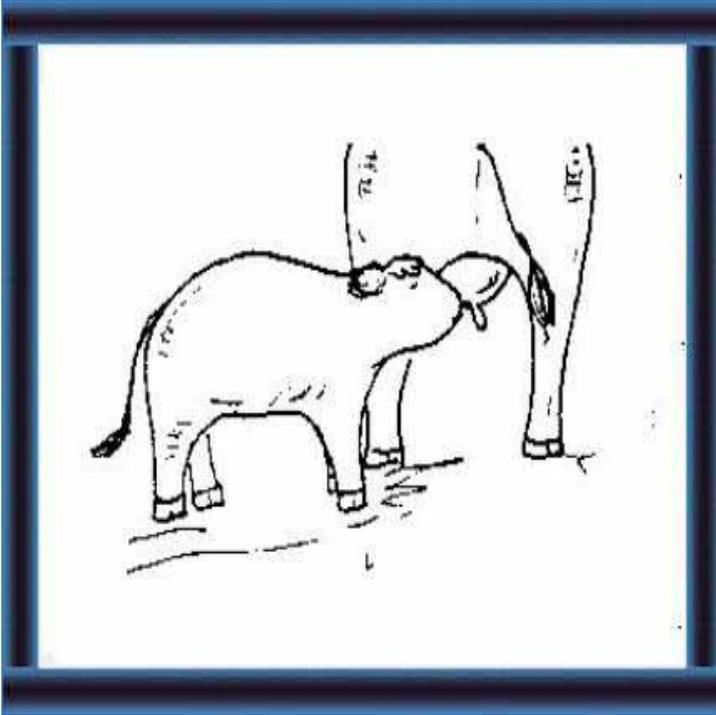
- let your calf **suckle freely** in day 1, the first suckling is within **3 hours after birth**
- let your calf suckle **3 times per day** in days 2-4.



8 Each feeding time is about:

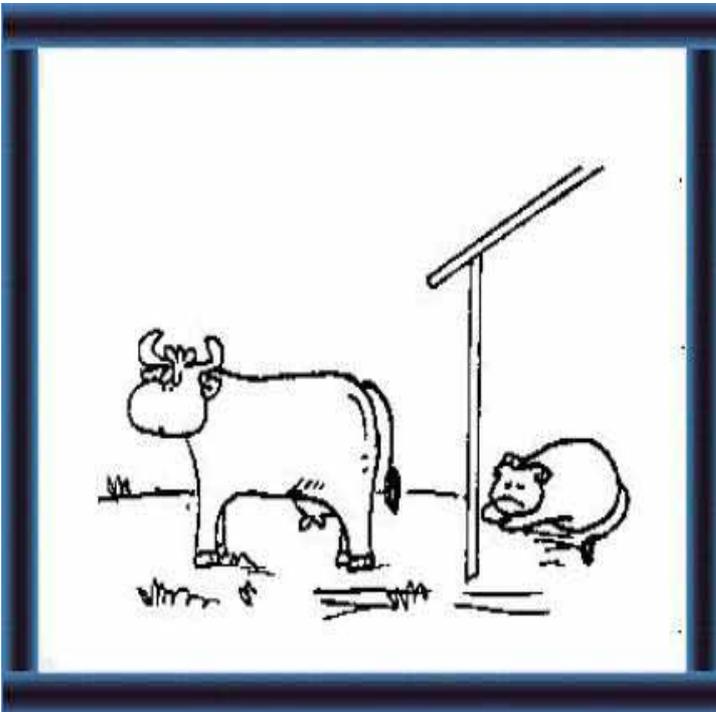
- 25 minutes if **housed**
- 15 minutes if **pastured**.

9 The **advantages** of suckling are:



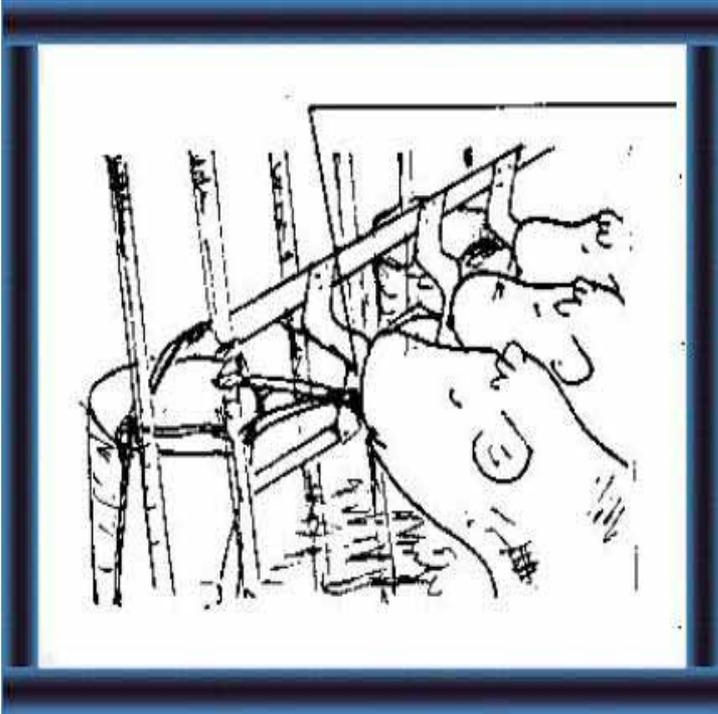
- the milk is at the **temperature of the udder**
- the stomach does **not overflow**
- your calf does **not get scours** through fast drinking
- the milk is **clean**
- you use **no labour**
- Zebu breeds sometimes do **not let down milk** without the calf.

page 201

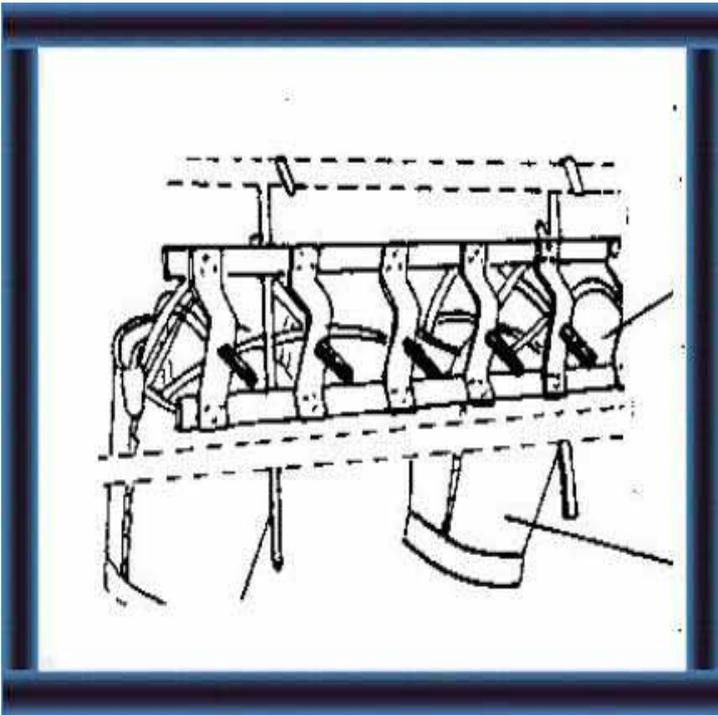


10 There are **some advantages** in **separating** your calf and dam at birth:

- **less** noise and disturbance
- you can easily **teach** feeding to calves who have not suckled
- you can keep **records** of consumption.

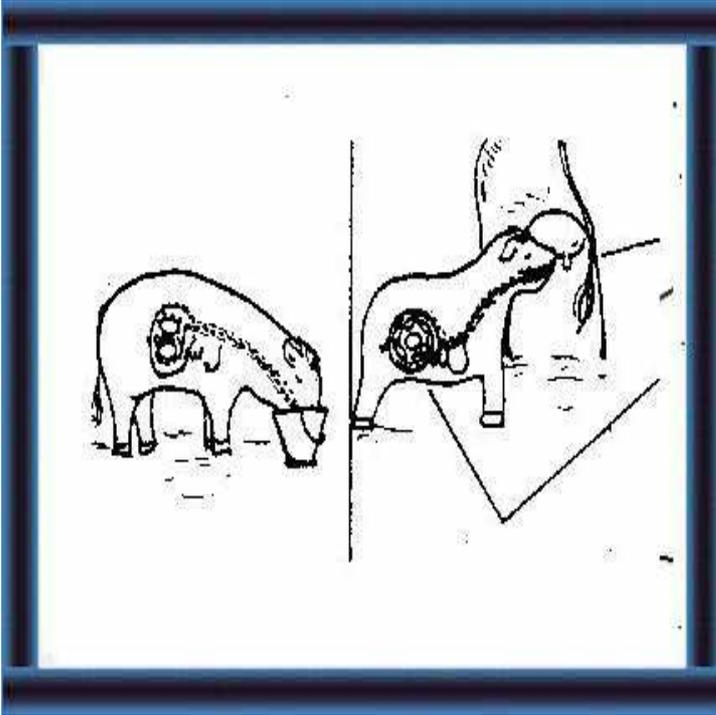


11 **Nipple feeding** is a good way to feed your calves.



12 **Buckets** hang at the **right height**.

**Rubber nipples** fit over tubes which lead into **colostrum** in the bucket.

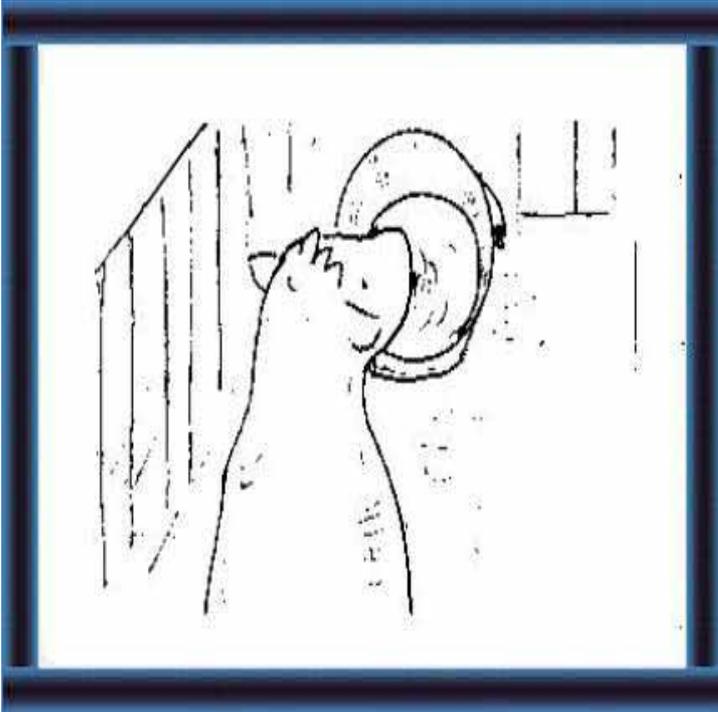


13 You can also use bucket feeding but nipple feeding is **better**:  
- it is like **suckling**  
- **digestion** is better.

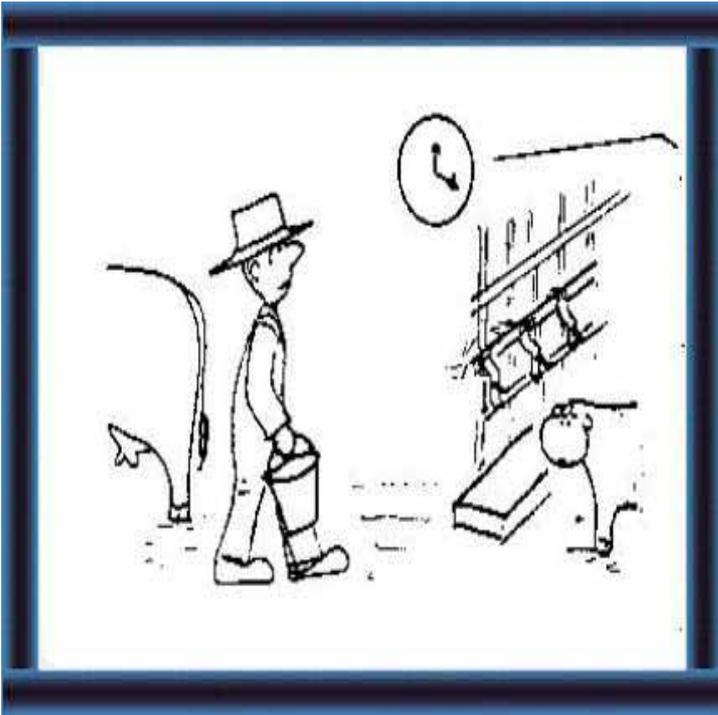
page 202



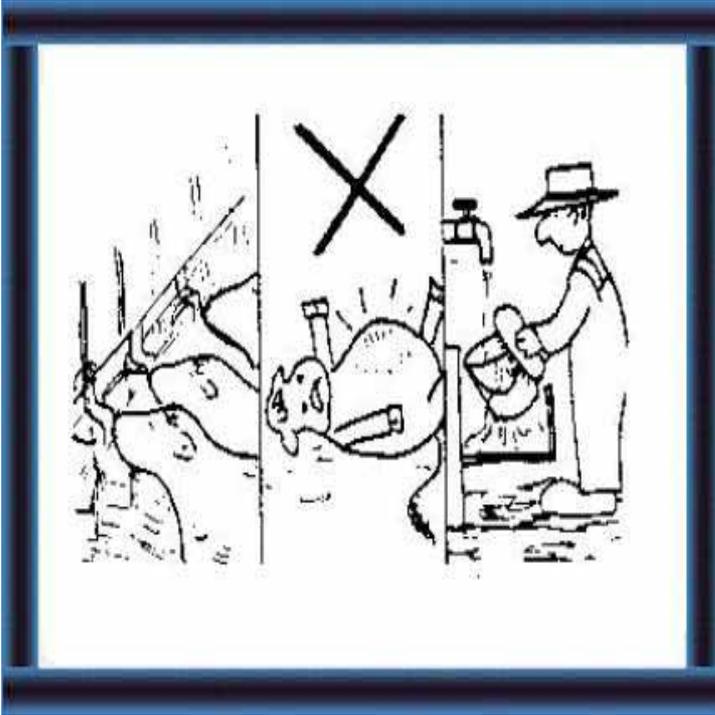
14 If you use bucket feeding, you must **teach** your calf how to feed:  
- hold your calf's head **near** the colostrum  
- put **two fingers** in your calf's mouth  
- **lower his head** into the colostrum



15  
- when your calf tastes the colostrum **remove** your fingers and let him **drink alone**  
- **repeat** until your calf can drink alone.



16 **Remember** in nipple or bucket feeding:  
- feed colostrum at the **temperature** of the udder and at the **same time** each day, this avoids fast drinking, indigestion and scours



- give your calf plenty of **clean water**
- feed your calves the **right amount**:
  - day 1-2 : 0.75-1 l (3-4 x/day)
  - day 3 : 1-1.5 l (3 x/day)
  - day 4-7 : 2-3 l (2 x/day)
- **do not** overfeed your calves
- **clean and disinfect** all equipment after each feeding.

page 203



#### **Weeks 2-7**

- 18 Each day, your calf **needs**:
- 6 l of **whole milk**
  - **concentrates** (fed freely) (up to 1/2 kg/day)
  - **hay** (**not** more than concentrates)
  - **water** (fed freely).



19 For weeks 2-7 you need a **total** amount of:

- 250 kg of **whole milk**
- 11 kg of **concentrates**
- 5 kg of **hay**
- a calf needs **at least**  $\frac{1}{7}$  of his body weight in **water** each day.



20 Concentrates contain about **20 % protein**.

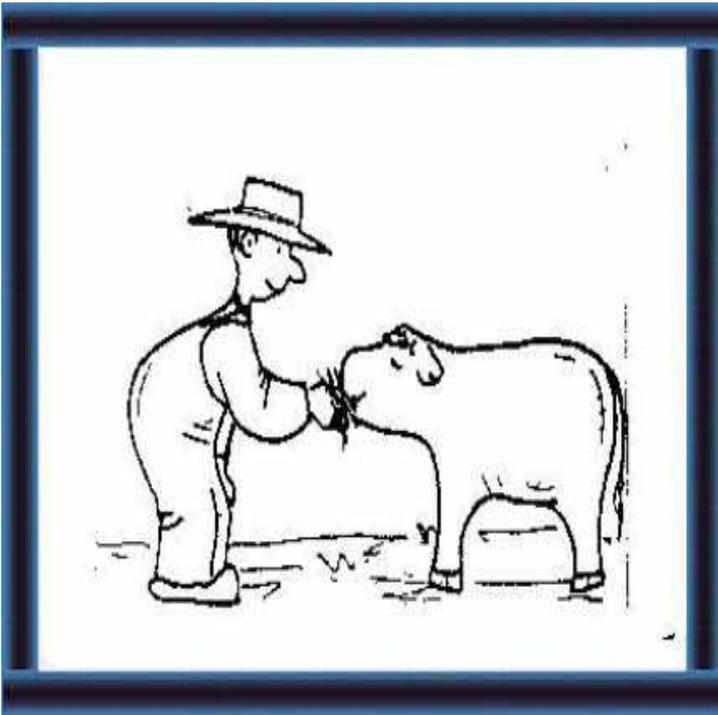
One possible mixture is:

- 50 % **cotton seed cake**
- 50 % **maize bran**.



21 You should use a **good hay** and **chop** it into **small pieces** to help **digestion**.

page 204



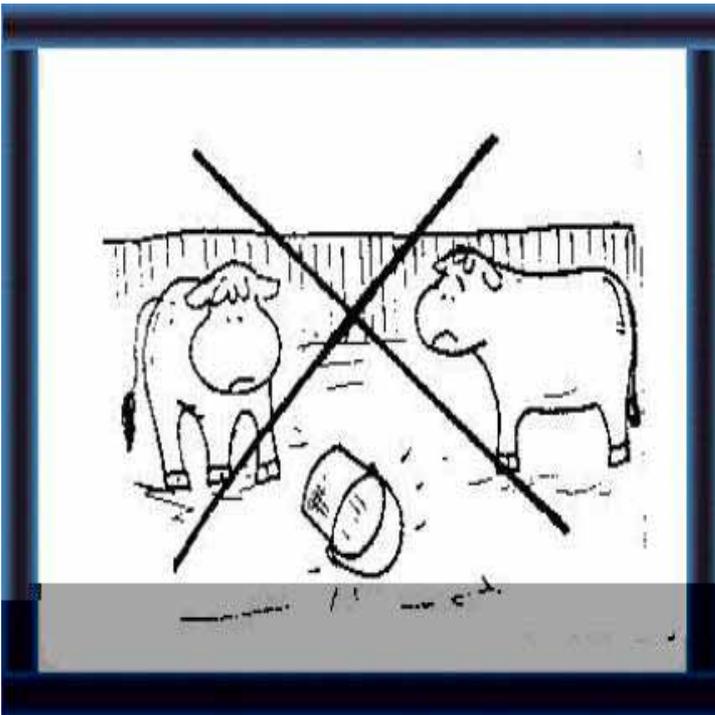
22 Begin **feeding hay** to your calves as young as **2 weeks**.

It helps:

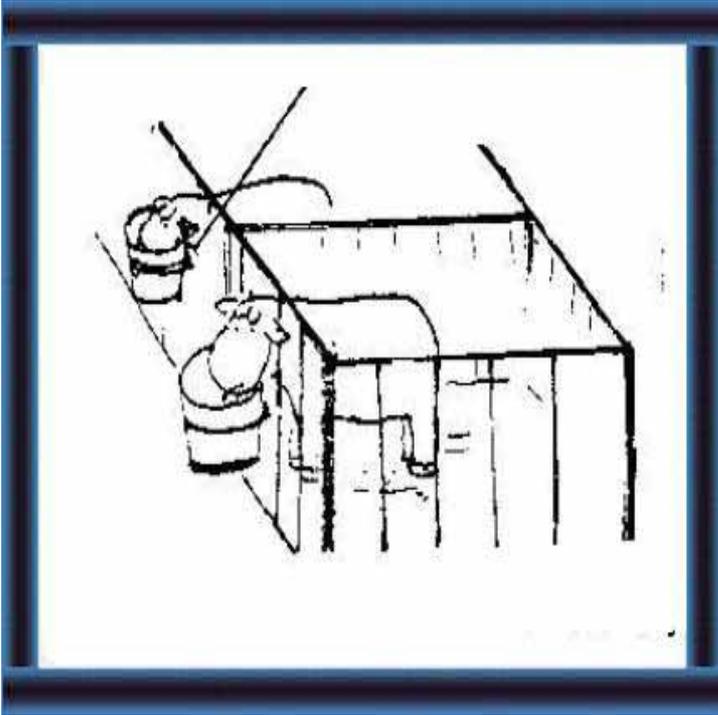
- develop the **rumen**
- provide **vitamins**
- **prevent anaemia and rickets**.



23 You can easily make **calf feeders** from bamboo and place them in the exercise yard.



24 **Make sure** your calves get **enough water**.  
In hot climates, each calf may need **more than 10 l/day**.



25 Secure water buckets with a holder so your calves can drink all the water they want.

page 205



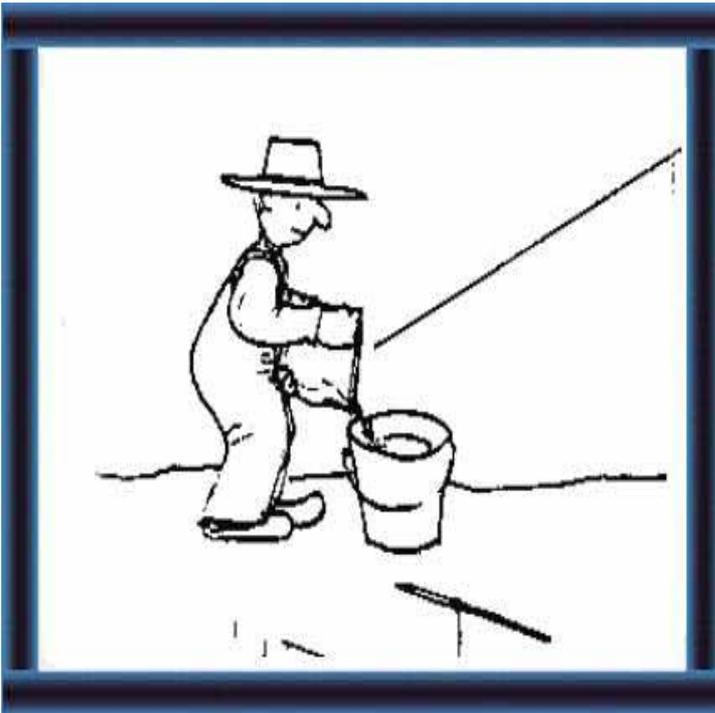
26 Instead of whole milk, you can feed your calf **milk replacer**.

One type you can make is **sour milk**:

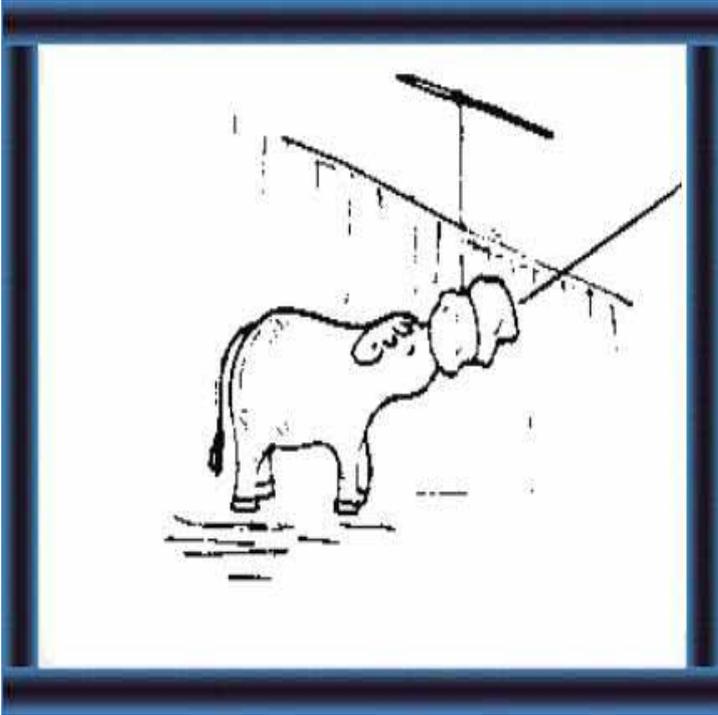
- add 20 g of **citric acid** to 10 l of **milk** 24 hours before feeding.



27 **Keep  $\frac{1}{2}$  l** of the sour milk; you can use this **instead** of citric acid to make the next feed. Sour milk:  
- **keeps longer**, you can make enough for 3 days feed and **save labour**  
- is **better** for your calf's digestion.  
**Important:** Add a **vitamin premix** if you use skim milk.

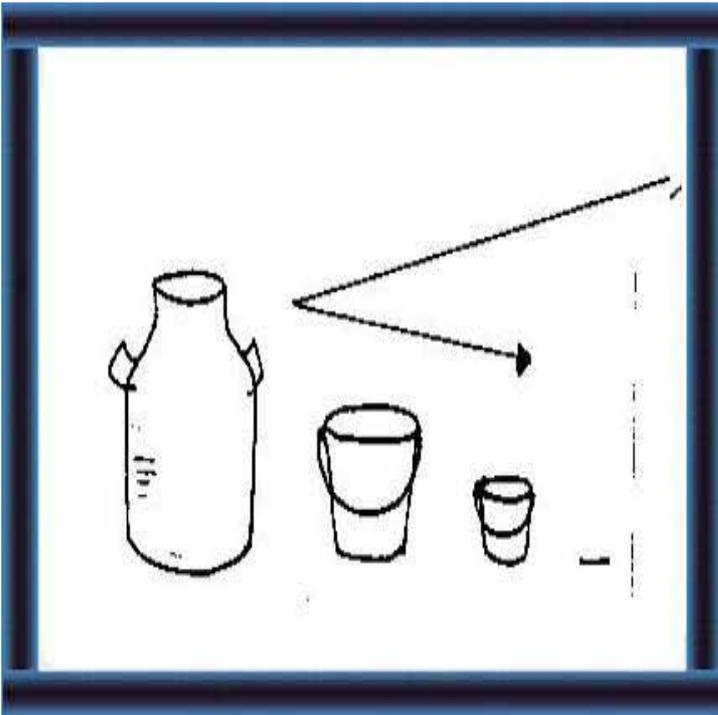


28 You can also use **milk replacer powder**. It contains **skim milk, fish and soya proteins** and **vegetable fat**. **Follow the directions** for mixing with water and **make sure every thing is clean**.



29 Hang a **mineral lick** so that your calves can get the **minerals and vitamins** they need.

page 206



**Week 8-16**

30 From week 8, you can begin to **wean** your calf off milk:

- **reduce** the amount of milk week by week

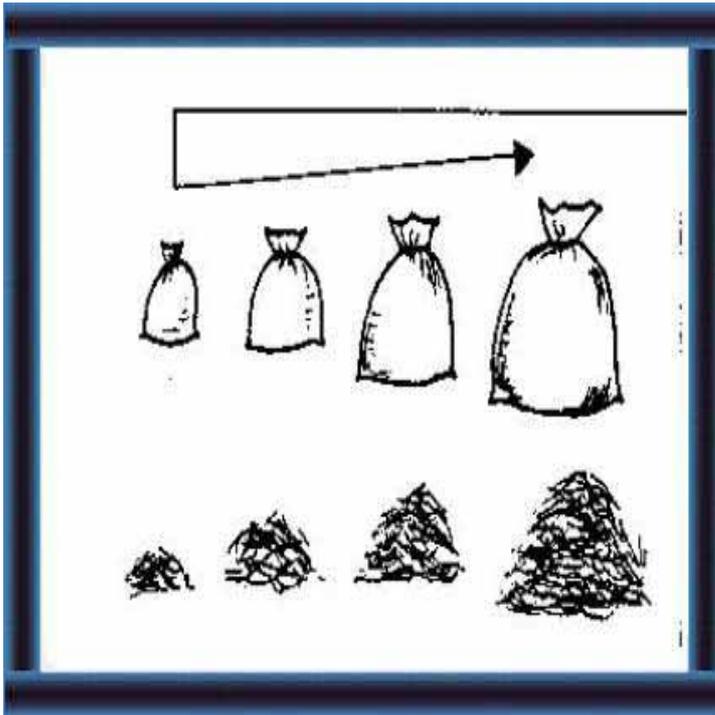
week 8 : 6 kg/day

week 9 : 6 kg/day

week 10 : 4 kg/day

week 11 : 2 kg/day

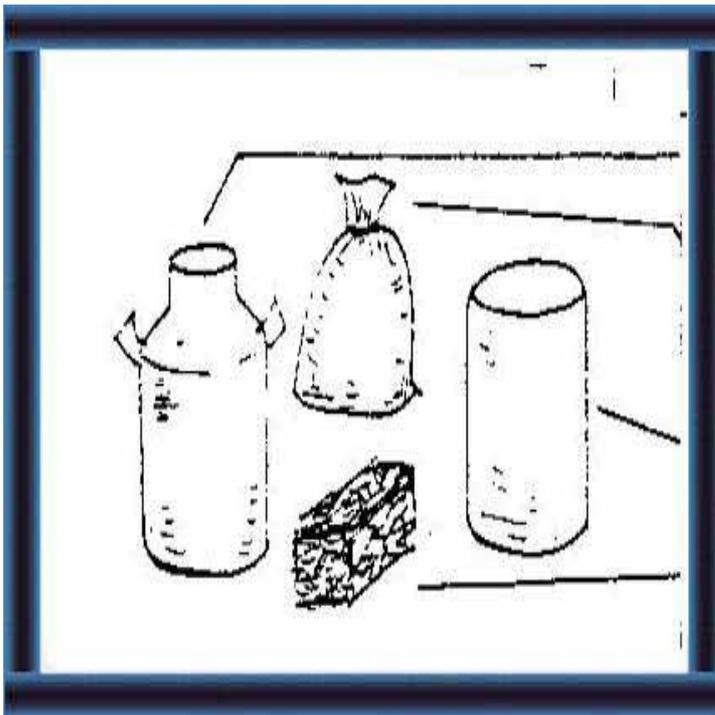
week 12 : 0 kg/day



31 At the same time, **increase** the amount of:

**Concentrates Hay/day**

- week 8 800 g 300 g
- week 9 1,000 g 350 g
- week 10 1,200 g 400 g
- week 11 1,400 g 500 g
- week 12 1,500 g 600 g



32 After week 12, **ration concentrates at 1.5 kg/day** and **give hay freely**.

For weeks 1-16, you need a **total amount** of:

- 140 kg of milk
- 42 kg of concentrates
- 15 kg of hay
- water freely.

**Weeks 17-25**

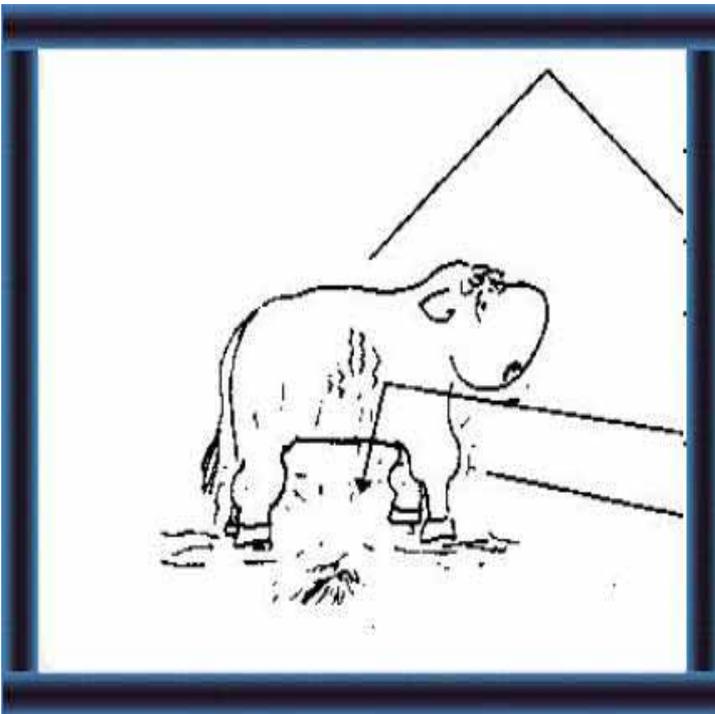


33 Feed your heifers **hay and water** freely with a **mineral lick** and 1-2 kg/day of **low-protein concentrates** such as:

- 25 % cotton seed cake
- 75 % maize bran.

page 207

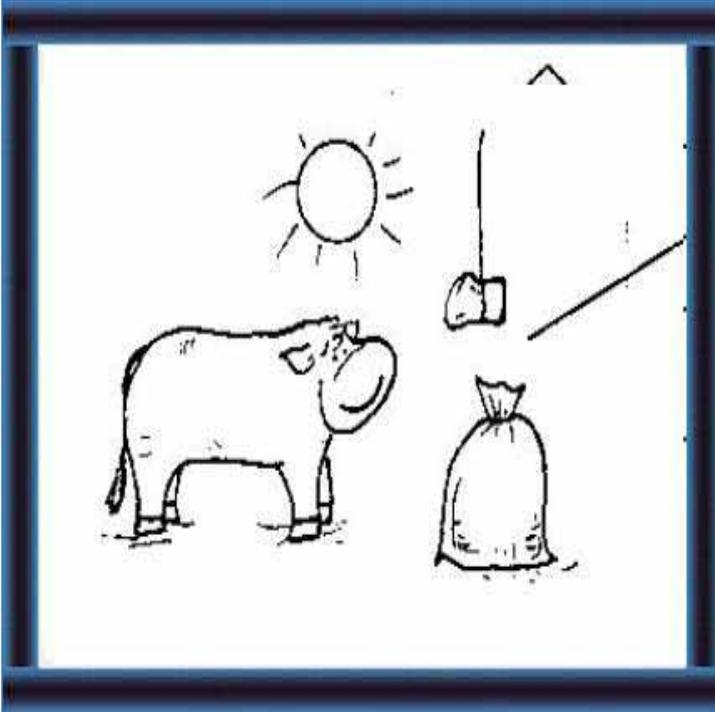
### What are the main health problems?



#### **Non-infectious diseases**

34 Your calf may **lack** some nutrients and show **signs** such as:

- rough coat
- change of coat colour
- loss of hair
- enlarged joints.



- 35 **Make sure** your calf gets:
- **enough** minerals, vitamins and concentrates
  - exercise, fresh air and sunshine.



- 36 Your **feeding routine** may be **poor**:
- different time each day
  - not enough water.
- Your calf will show **signs** such as:
- lying down
  - diarrhoea!
- In serious cases, your calf may **vomit**.

37 Set up a **good feeding routine**



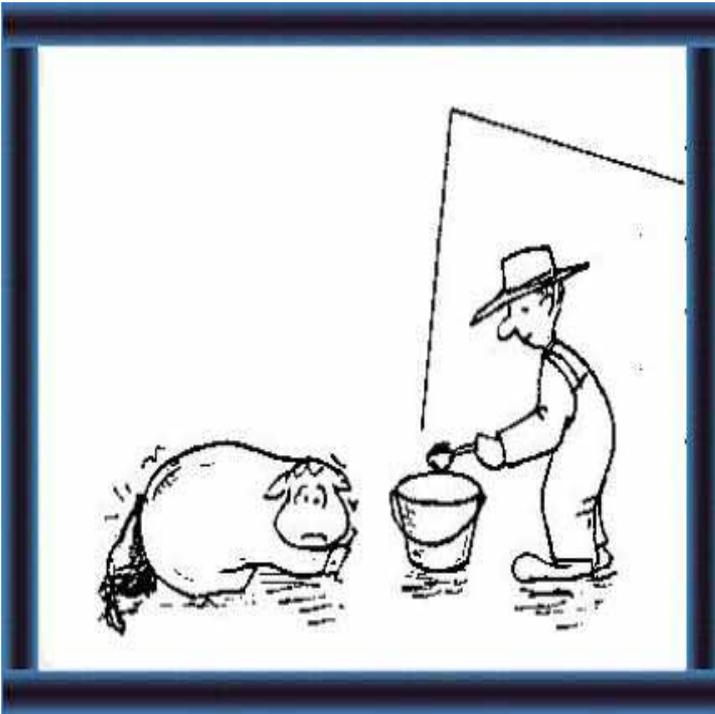
page 208

by:

- feeding at the **same time** each day
- feeding **more often** if your calf is eating too fast

- making sure everything is **clean**.

If your calf has **diarrhoea**, **act quickly!**



**Day 1**

38

3 times/day:

- add **9 g of sodium chloride** to **1 l of water** and feed.

Give **no other** dry or liquid feed.



**Day 2**

39 Mix **1.7 l of milk** with **2.6 l of water** and divide into 3 parts.

Give **3 times/day**.



**Day 3**

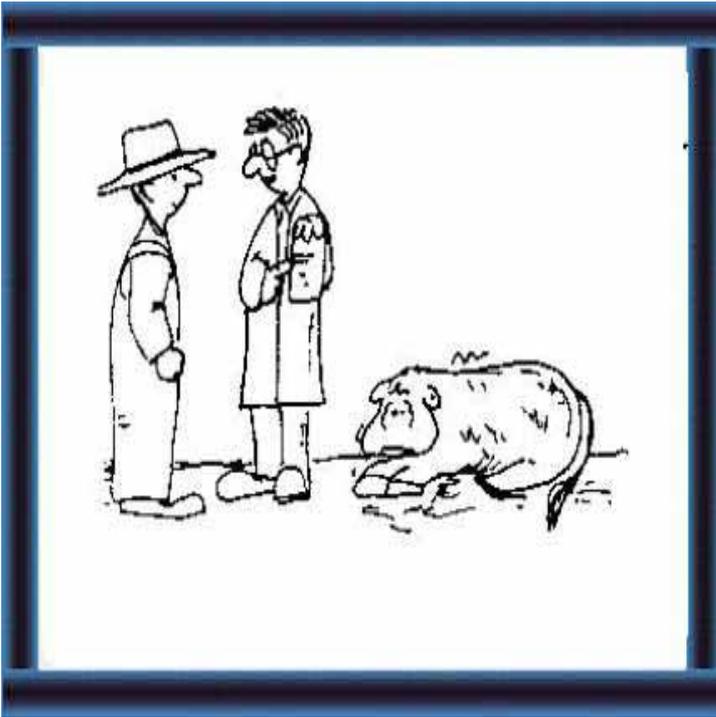
40

Mix **2.6 l of milk** with **1.7 l of water** and divide into 3 parts.

Give **3 times/day** and continue each day until your calf is normal.

41 In cases of **severe** diarrhoea, give an anti-diarrhoea agent.

**Consult your vet and follow directions carefully.**

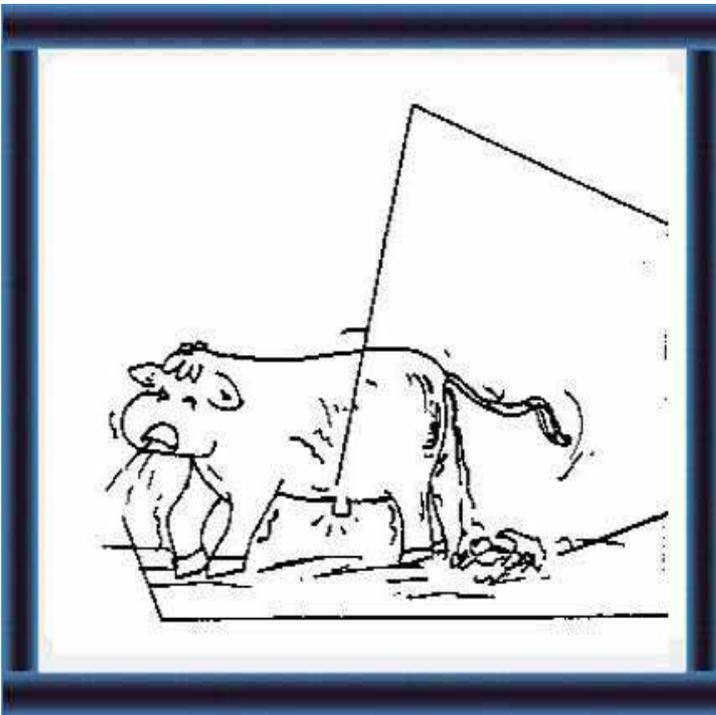


41 In cases of **severe** diarrhoea, give an anti-diarrhoea agent.

**Consult your vet and follow directions carefully.**

page 209

**Bacterial and virus diseases** (See H. 10 and H. 11)



42 Look out for **signs** of:

- navel infections
- fever
- diarrhoea with blood or mucus
- coughing and breathing difficulty.



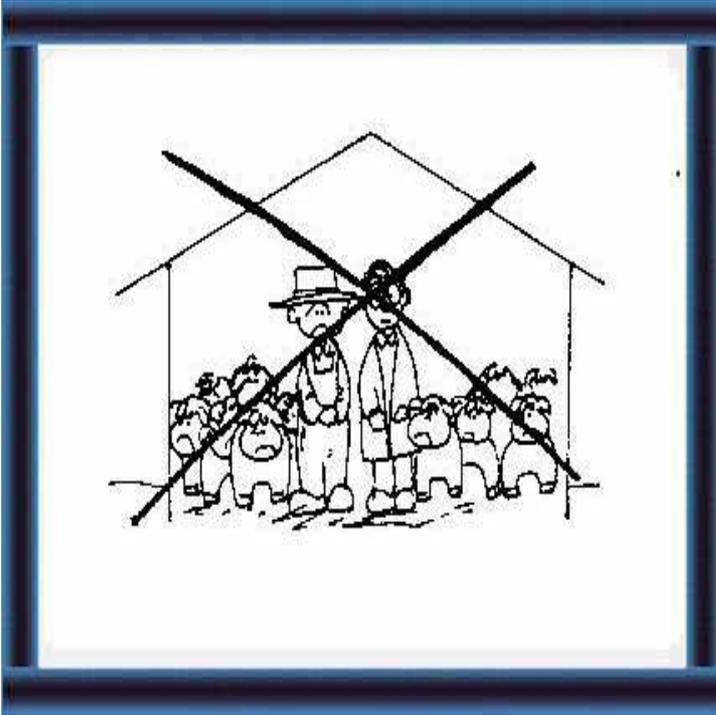
43 **Isolate** the sick calf in a pen away from the others.

**Consult your vet** about treatment with disinfectants, anti-diarrhoea agents or antibiotics and **follow directions carefully**.



44 **Check your feeding routines:**

- colostrum feeding
- enough vitamins and minerals
- hygiene.

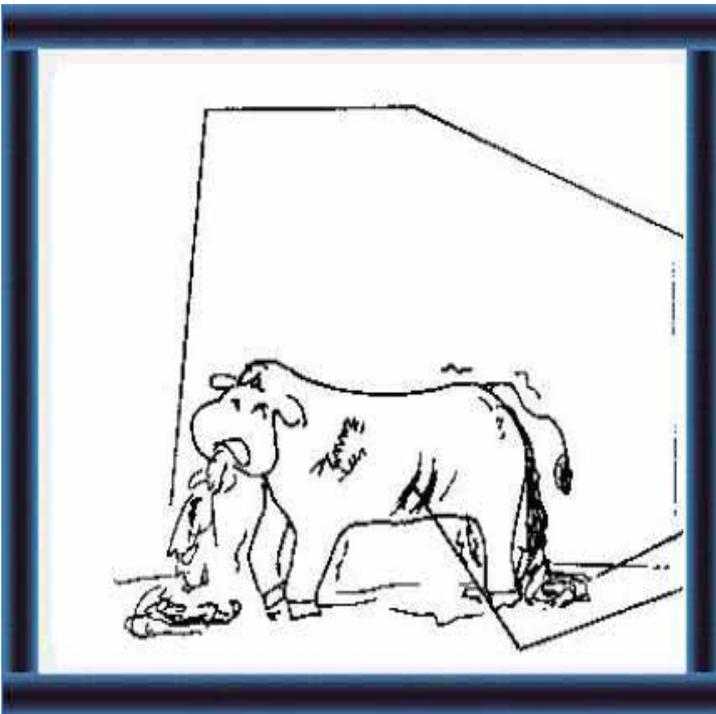


**45 Check your housing:**

- good temperature and ventilation
- no overcrowding
- good hygiene.

page 210

**Parasites** (See H. 10.6)



**46 Look out for signs of:**

- digestive trouble
- poor growth
- diarrhoea
- rough coat.



47 **Isolate** the sick calf.

Bring a **sample of faeces** to the vet for analysis.

**Follow his directions** about treatment **carefully**.

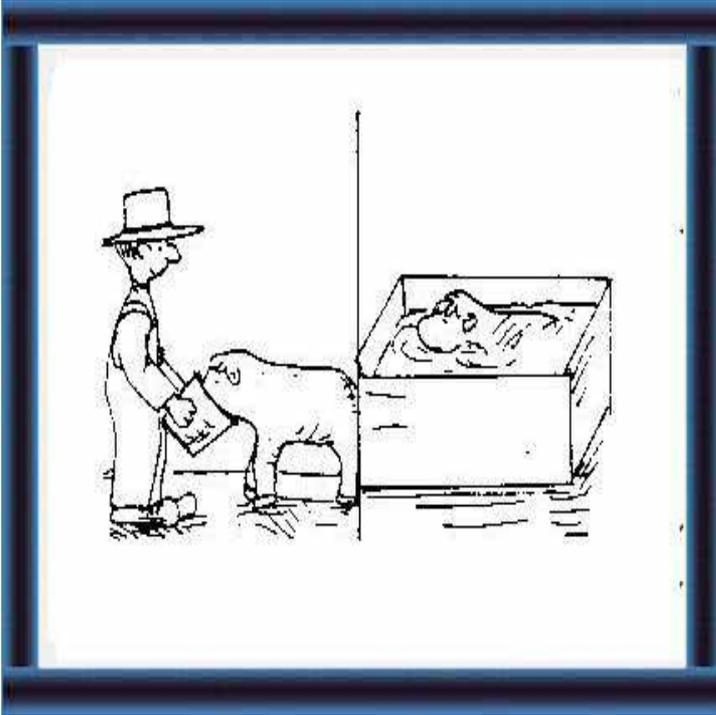
This will include a schedule for:

- deworming
- vaccinations.



48 **Check your housing and grazing routines:**

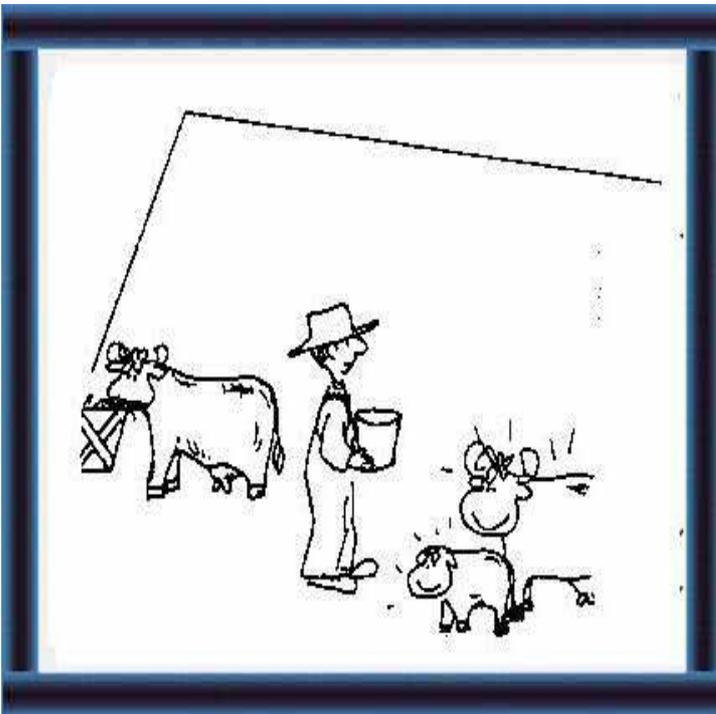
- good hygiene
- no feeding from ground or near wet areas
- moving pastures and no overcrowding
- free from insects.



49 Give the **right medicine** at the **right time**.

page 211

**What are the main ways to prevent health problems?**



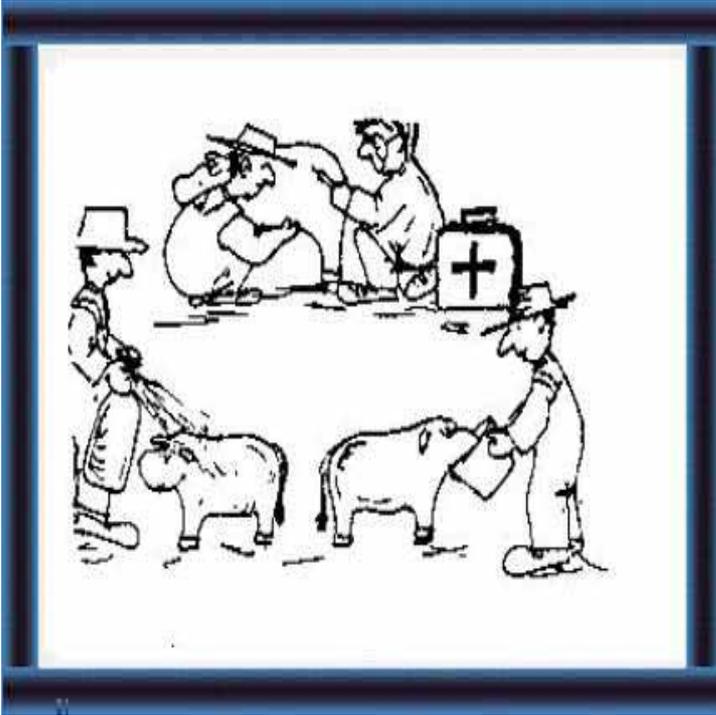
50 **Good feeding** of pregnant cows and **hygiene during calving**.



**51 Early feeding with colostrum and enough hay, concentrates, vitamins and minerals as your calves grow.**



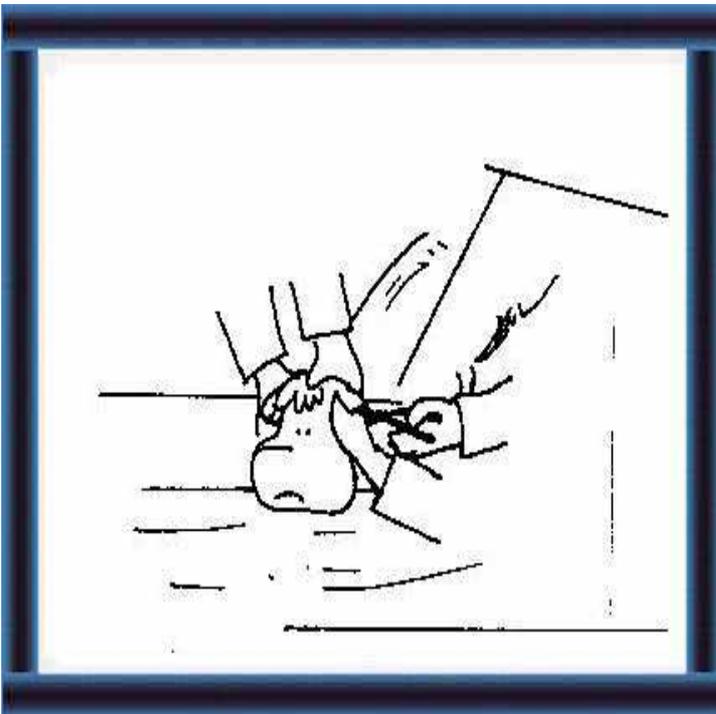
**52 Clean, dry housing with good ventilation:**  
- separate sick calves  
- do not mix calves of different ages.



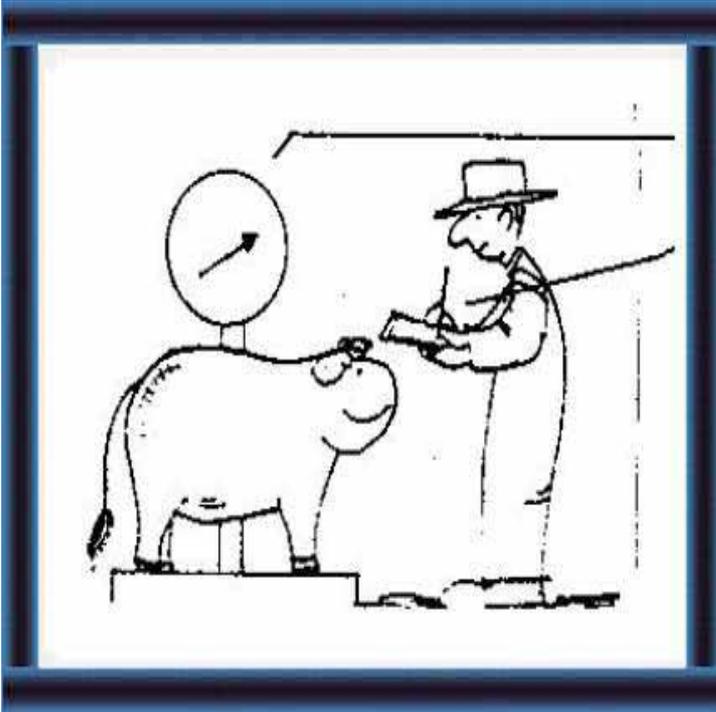
**53 Medicines, injections and sprays given at the right time in consultation with your vet.**

page 212

**How can you keep records of growth? (See H. 6.2.)**



**54 When you separate your calf from the dam, tag the ear.**

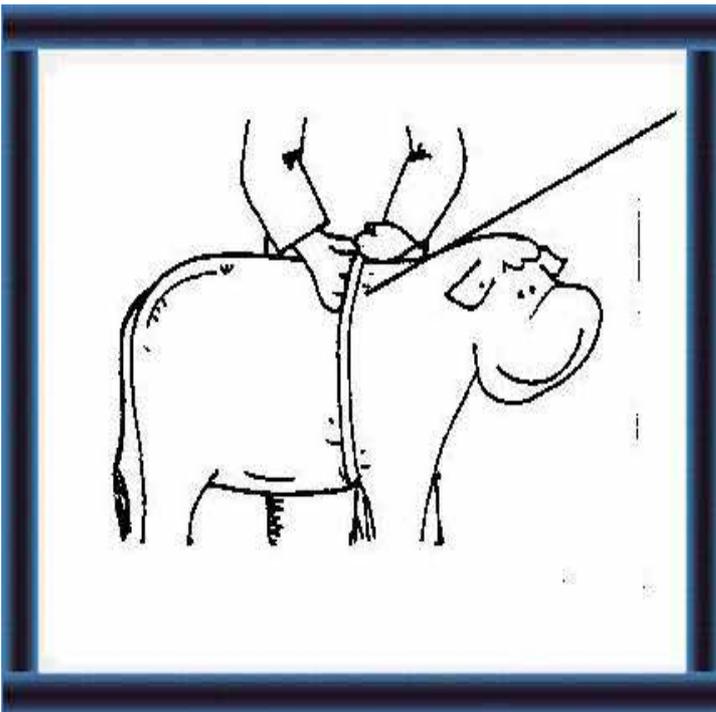


**55 Weigh** your calf at birth and each month after birth, keep a **record of weight gain.**

Growth should be at least **500 g/day.**

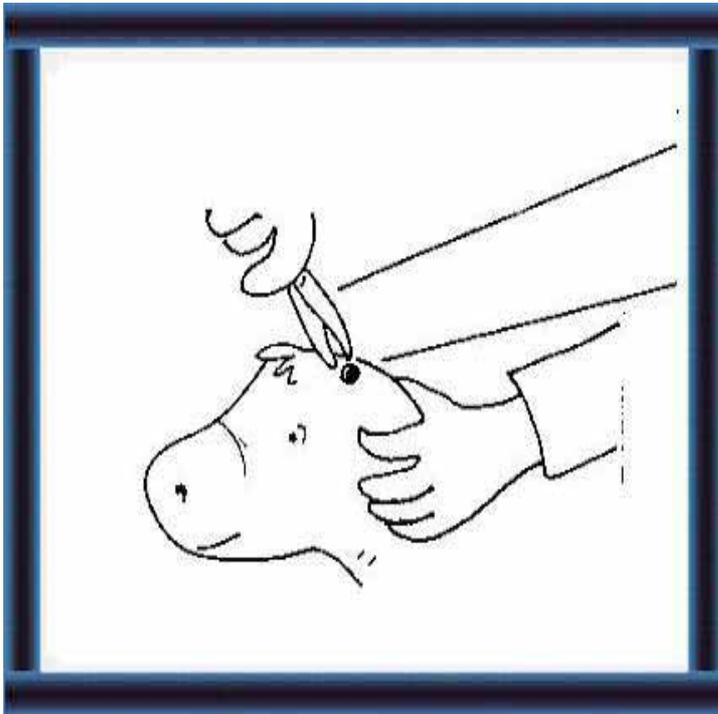
**56** If you cannot weigh your calf, **measure the breast circumference:**

<b>Breast Circumference</b>	<b>Approx Wght</b>
<b>cm</b>	<b>kg</b>
<b>inches</b>	
70.0	
27.6	40.0
85.5	
33.6	60.0
95.5	
37.6	80.0
104.0	
41.0	100.0
111.0	
43.5	120.0
117.0	
46.0	140.0
122.5	
48.2	160.0
127.5	
50.2	180.0
132.5	
52.2	200.0
137.5	
54.1	220.0
142.0	
55.8	240.0
147.0	
57.8	260.0
158.0	
59.8	280.0



150.0	
61.4	300.0
159.0	
62.6	320.0
162.5	
64.0	340.0
165.0	
65.0	360.0
168.0	
66.3	380.0
171.0	
67.4	400.0

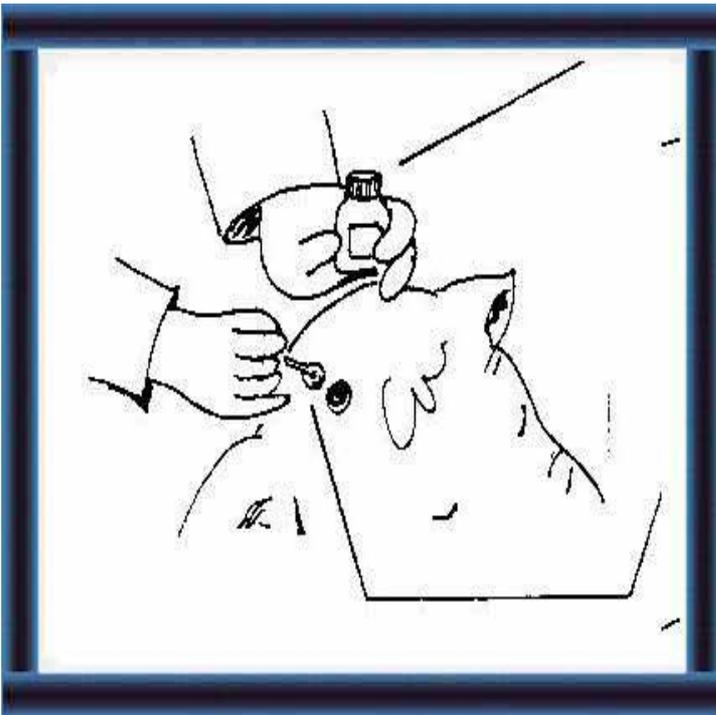
**How can you dehorn your calf ?**



**57 Clip** hair away from the **horn bud**.



**58 Wipe** the bud clean with **spirit** or a **cleansing solution**.



**59 Dip** a wooden handled brush into **collodion**.

**Apply** a small amount to the **horn bud** and rub in.

**Do not** touch the surrounding skin.

After the collodion is dry **apply again** without rubbing.

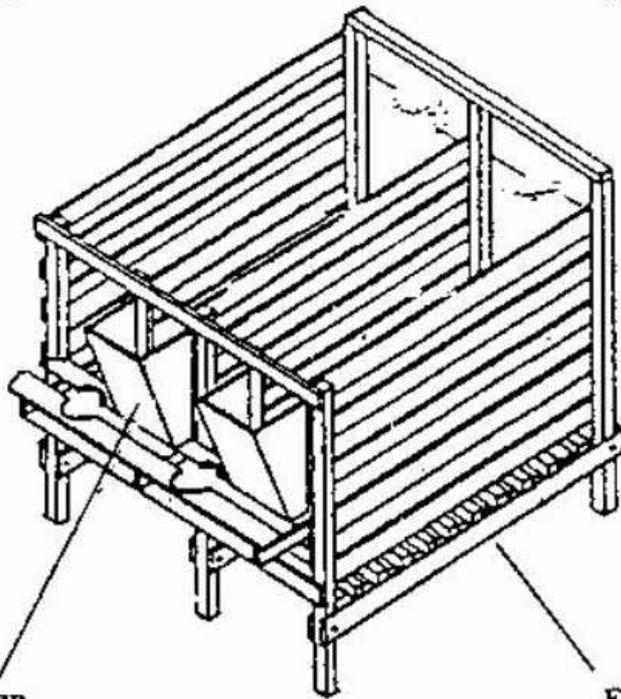
**What is important in housing?** (See H.3)

60  
**Good temperature and ventilation with no drafts.**

**Good temperature and ventilation with no drafts.**

**Enough space  
for your calf**

**Strong, low cost materials  
which are safe for your calves**



**Good design  
for feeding**

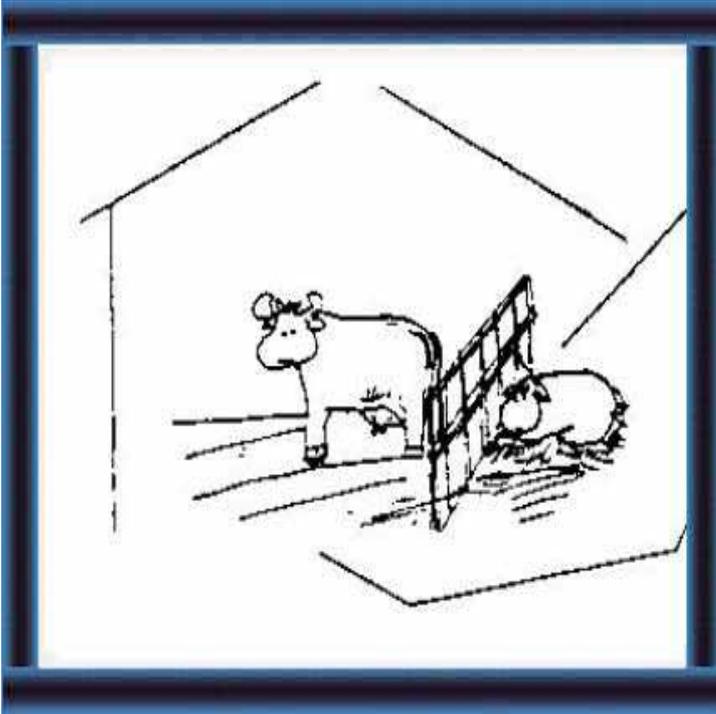
**Easy to clean and  
stays dry**

**Separate calf pens to:**

- **reduce disease and parasites**
- **allow calf to eat his whole ration**
- **allow you to control feeding**

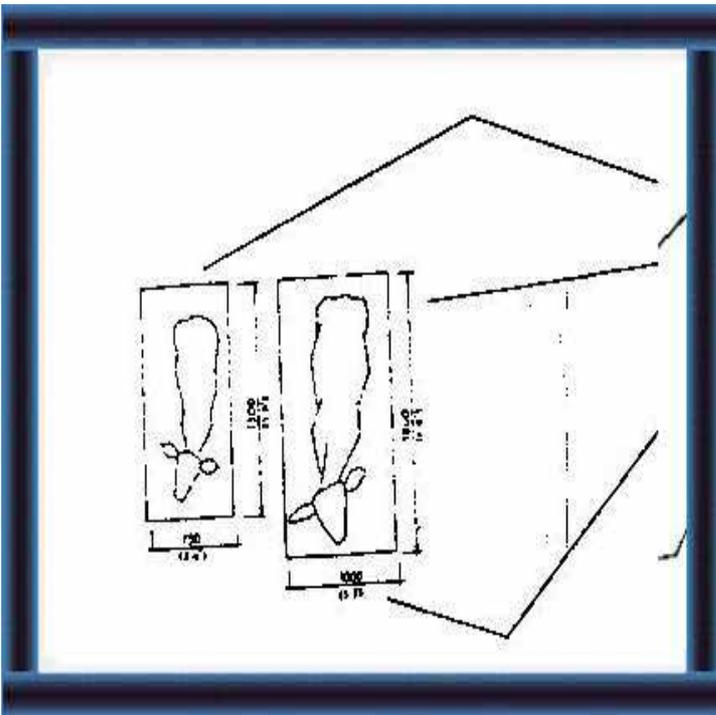
**Separate calf pens to:**

- **reduce disease and parasites**
- **allow calf to eat his whole ration**
- **allow you to control feeding.**



61 If you cannot have a separate calf pen:  
- **tie** your calf in the cow shed  
- **separate** your calf from the dam.  
**Make sure the floor slopes** to keep the calf's area **dry**.

page 215

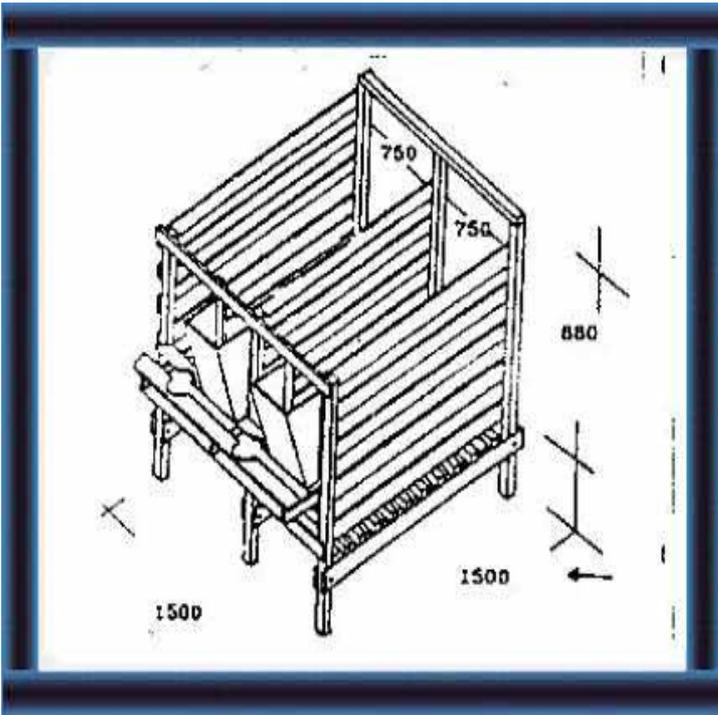


62 Your calf needs **more space** at 8 weeks, than at 4 weeks.

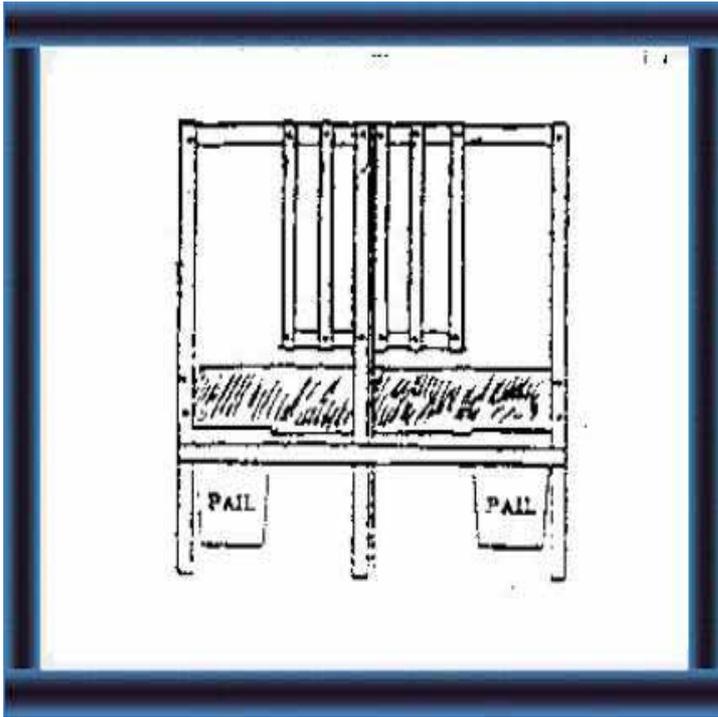
The **width** of the pen should be more than the calf's **shoulder height**.



63 These three pens show examples of structures and measurements.

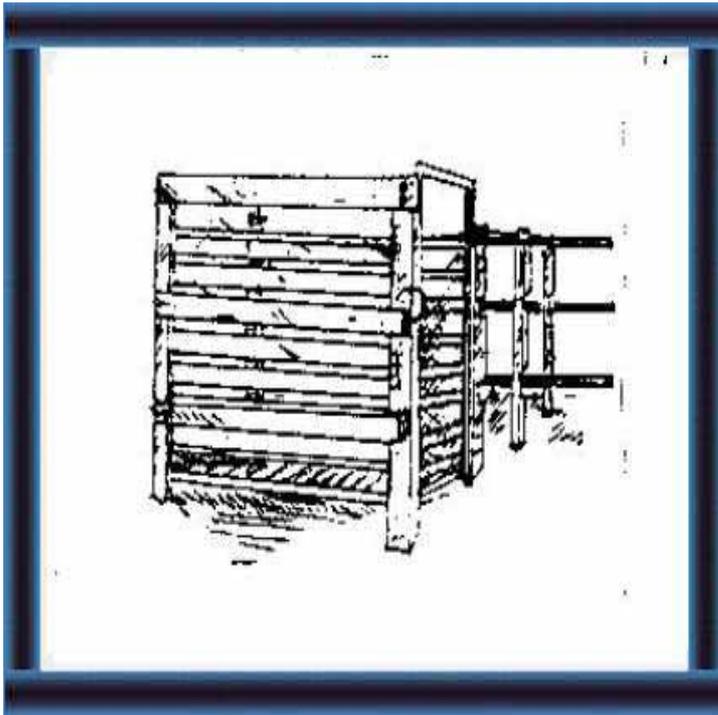


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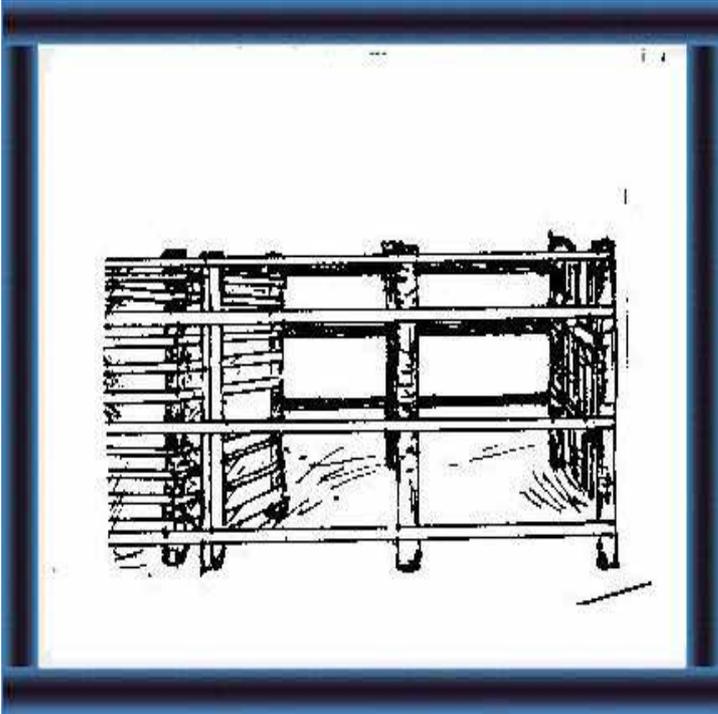


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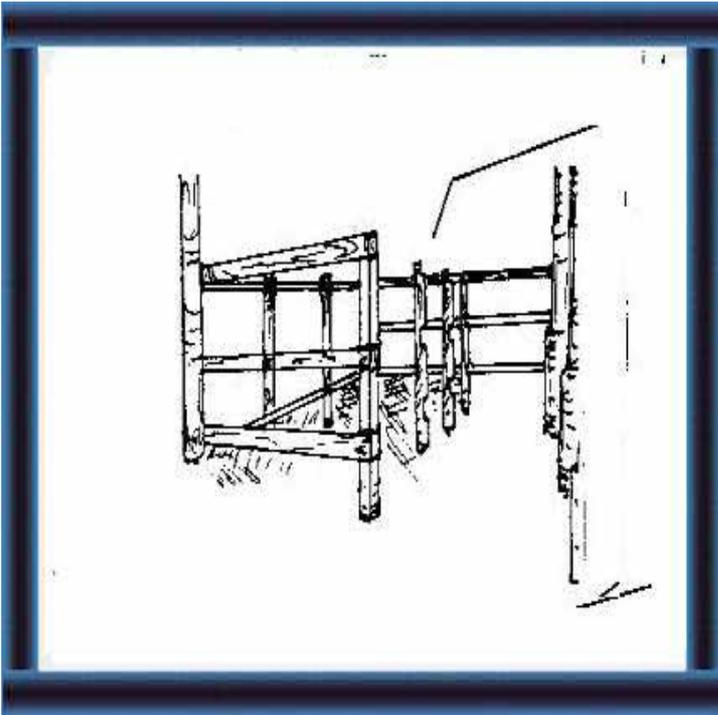
page 216



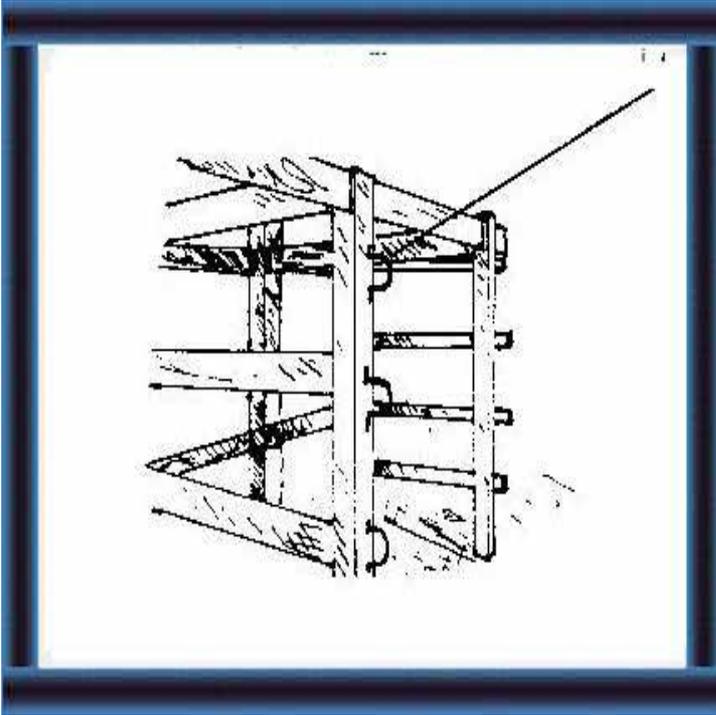
66 You have **little space** on your farm.  
Design individual calf pens, so you can **change** them into **group pens**



67 or take them to **pieces** and **store** them

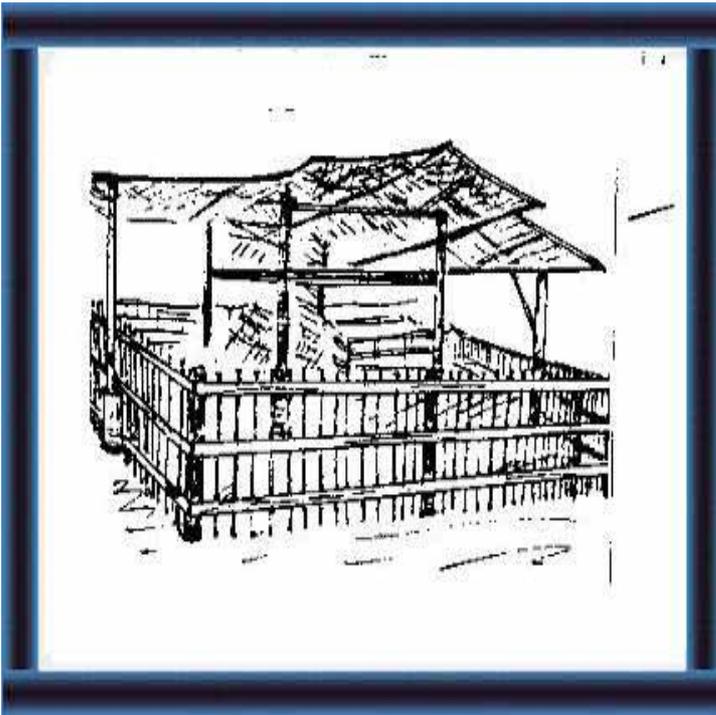


68 leaving only the corner posts.



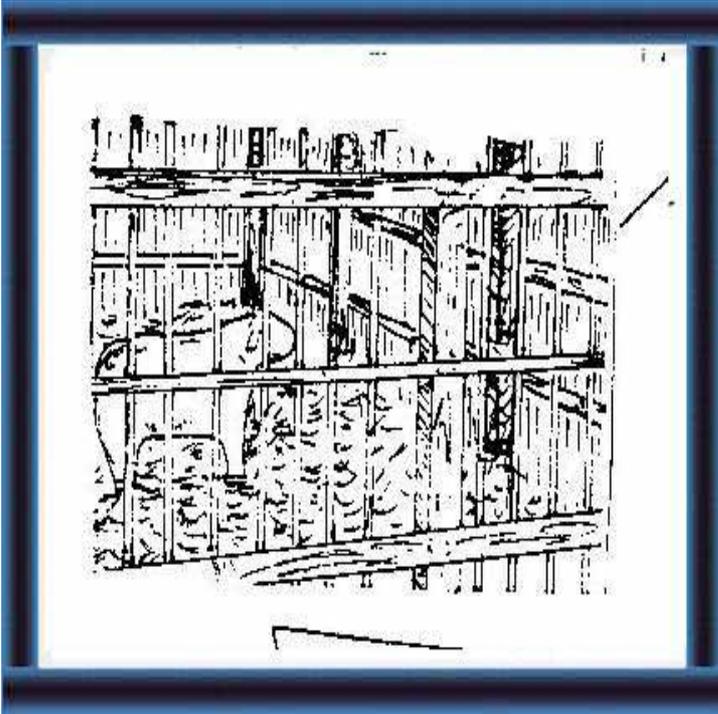
69 Pole holders hold runners for use as a **group pen**.  
Add dividers for **individual pens**.

page 217



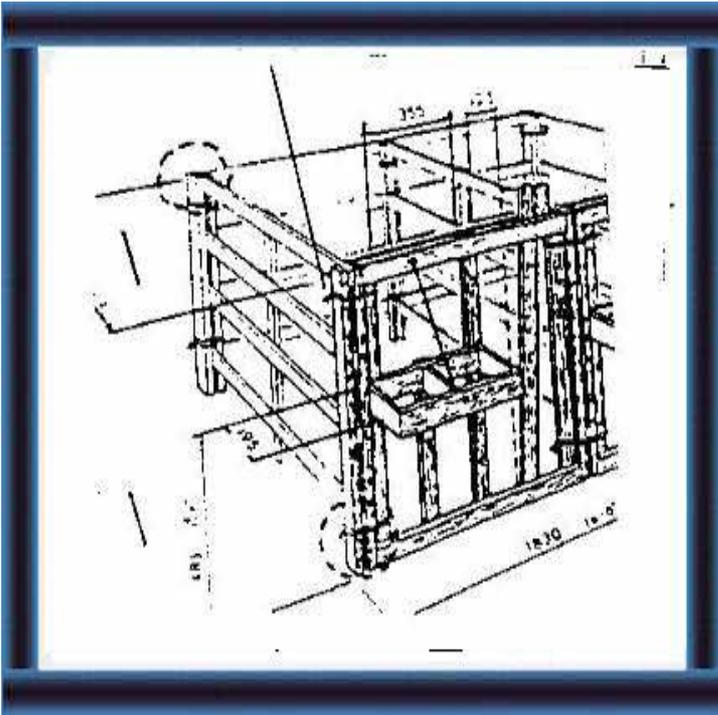
70 The group pen leads to an **open area** for exercise.

The **extended roof** provides **shade** and **shelter**.

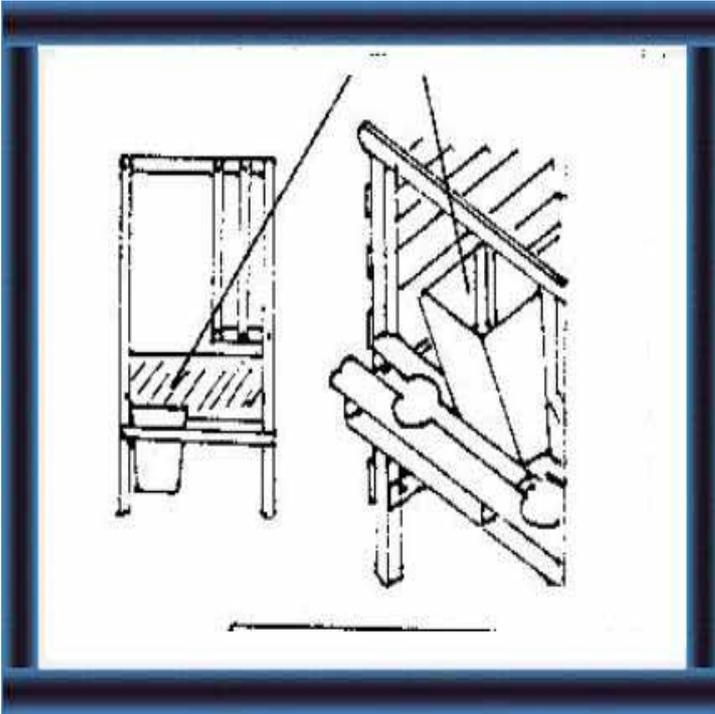


71 Fence the exercise area.

You can use ropes from **palm fibre** for tying:  
- staples and nails are **dangerous**.



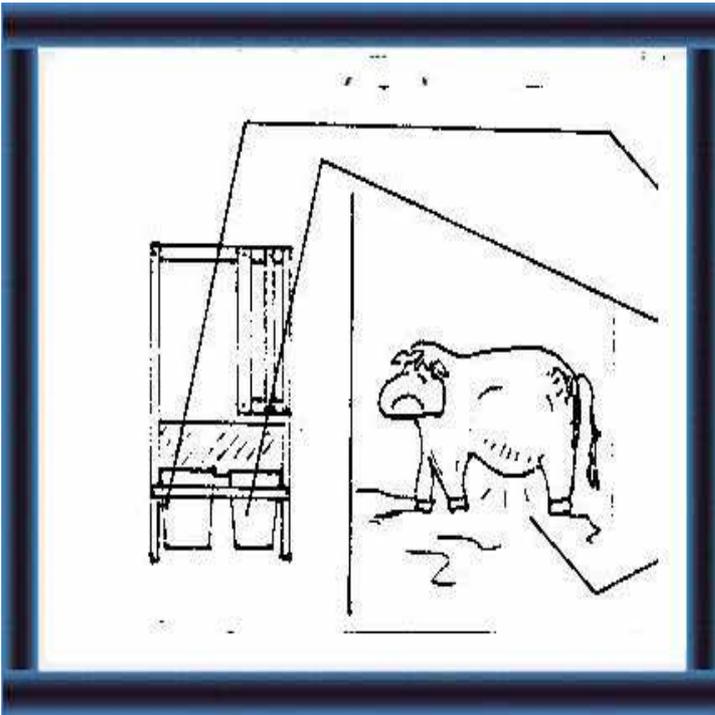
72 Use ropes in the same way for individual pens.



73 These calf pens have only **1 bucket**.

They are suitable for feeding calves in the **first month**:

- for **milk feeding**
- for **concentrate feeding**.

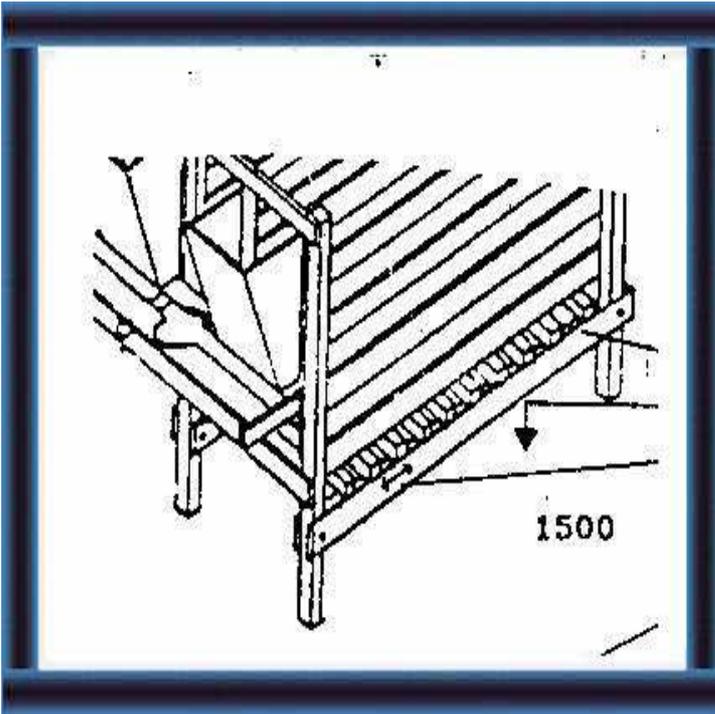


74 After weaning, the pen should have **2 buckets**:

- one for **water** (fed freely)
- one for **concentrates** (fed freely).

**Do not** mix water and concentrates.

The mixture becomes **sour** and causes **digestive problems**.

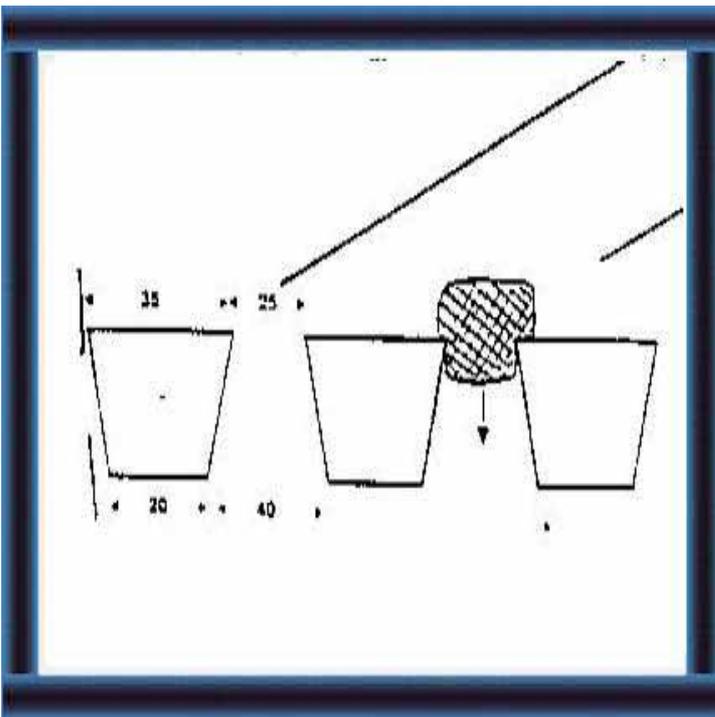


75 If you have no bedding, make a **slatted floor** to give your calf a **dry resting place**.

Slats should be at **right angles** to the long side.

This shape allows droppings to **pass easily**.

Slat to slat distance can be from 20-25 mm.



76

<b>What do you know about calf rearing ?</b>																
<b>Feeding</b>	<b>In Week 1, decide on:-suckling</b>										<b>(7-9)</b>					
											<b>-separating calf and</b>					
<b>dam</b>											<b>(10)</b>					
											<b>- nipple feeding</b>					
											<b>(11-12)</b>					
											<b>- bucket feeding</b>					
											<b>(13-16)</b>					
Week 1 (6-17)	Weeks 2-7 (18-29)							Weeks 8-16 (30-32)								
<b>Week: 1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	
Day:1-2 3            4																
<b>Colostrum/ day (kg)</b> 1 1.5            3																
<b>(kg) Milk or Milk Replacer/ day</b>	6	6	6	6	6	6	6	6	4	2						
<b>Concentrates/ day (kg):</b>	0.2	0.3	0.3	0.3	0.4	.6	0.8	1.0	1.2	1.4	1.5	1.5	1.5	1.5	1.5	
<-----adlib-----> <-----rationed----->																
<b>(kg) Hay/day</b>		0.1	0.1	0.1	.15	.2	0.3	0.3	.35	0.4	0.5	0.6	0.7	0.8	0.6	
<b>Separate Sexes</b>																
<b>Housing</b>	<b>Pen with clean bedding</b>	<b>Collective stall with calves of same age</b>					<b>Open stable in larger group</b>					<b>Heifers-pasture, Males-stable&amp;fatten</b>				
<b>Health</b>	<b>Exercise, fresh air, sunshine &gt;</b>	<b>Trim hooves</b>					<b>Vaccinate heifers against Brucellosis</b>									
	<b>Protect against parasites &gt;</b>															
<b>Records</b>	<b>Tag ears</b>	<b>Weigh often &gt;</b>														
	<b>(54-56)</b>	<b>Record feed consumption</b>														
<b>Dehorning</b>	<b>-clip hair</b>															
	<b>(57-59)</b>	<b>-clean</b>														
		<b>apply collodion</b>														



