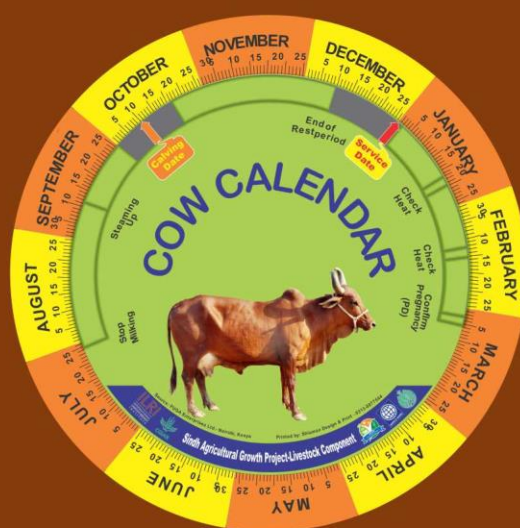


SINDH AGRICULTURAL GROWTH PROJECT



Training Facilitator Guide on Animal Reproduction and Breeding

E. Kang'the, M.N.M. Ibrahim, S.A. Khan and J. Githinji

*(Sindhi & Urdu versions of this manual was Translated by:
Deepesh Bhuptani, Barkat Ali, Ubaid Qureshi and Shahzad Iqbal)*

June 2020

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PREFACE AND ACKNOWLEDGEMENTS

It is well known that dairy production is influenced to a large extent by the efficiency of feeding practices, animal health management, reproduction and breeding management. All these practices have a direct impact on productivity, health status and herd improvement in dairy animals. As such proper dairy management practices is key to sustain productivity and hence the profitability. Under the Sindh Agricultural Growth Project (livestock component) these aspects of dairy cattle and buffalo management were identified as constraints for enhancing milk production. Also, the lack of knowledge of all stakeholders involved in the dairy value chain (DVC) on modern dairy management practices further hindered productivity of dairy animals.

In order to rectify these gaps in knowledge the International Livestock Research Institute (ILRI) was recruited under a consultancy agreement in July 2017 with the mandate to capacity build all stakeholders involved in the DVC. ILRI with its knowledge in executing other livestock projects in Pakistan, designed capacity building and training interventions for various stakeholders at Provincial, District, Field level staff and dairy farmer producer groups. Training materials were prepared by ILRI team from ILRI publications listed at the end of this manual, and finalized after several rounds of discussions with Sindh Livestock Department staff, SAGP-L staff and Plan Int - Pakistan staff. Using these training materials (English/Sindhi/Urdu), over the past 3 years ILRI conducted more than 12000 training programs/activities on various aspects of dairy production to provincial staff, district staff (VOs, Para-vets, LA), and to the 153 MPG members and non-members in the 11 project districts.

The final output of these trainings is the publication of three Facilitation training guides; namely **Feeds and Feeding, Animal Health Management and Reproduction and Breeding**. These training manuals are prepared in English, Sindhi and Urdu languages.

We are indebted to Department of Livestock & Fisheries, Government of Sindh and SAGP-L for their continued support provided during planning and execution of workshops. We are grateful to participants of the workshops (DFMs, LLS, Deputy Directors of Districts, ILRI Pakistan staff and Plan Int. staff) for their valuable inputs during discussions in finalizing the Training materials/manuals. We gratefully acknowledge the support provided by Phillip Sambati (Instructional Designer/ILRI Nairobi) for initiating the preparation of the Facilitator Manual template, and Dr. Okeyo Mwai (Senior Scientist, ILRI Nairobi) for conducting the Animal Reproduction and Breeding trainings, and to ILRI Pakistan Training Associates (Drs. Deepesh, Barkat, Ubaid and Shahzad) for assisting in preparing the training materials and also with the translations of these manuals into Sindhi and Urdu.

Finally, World Bank funding through the SAGP-L project for publishing these manuals is gratefully acknowledged.



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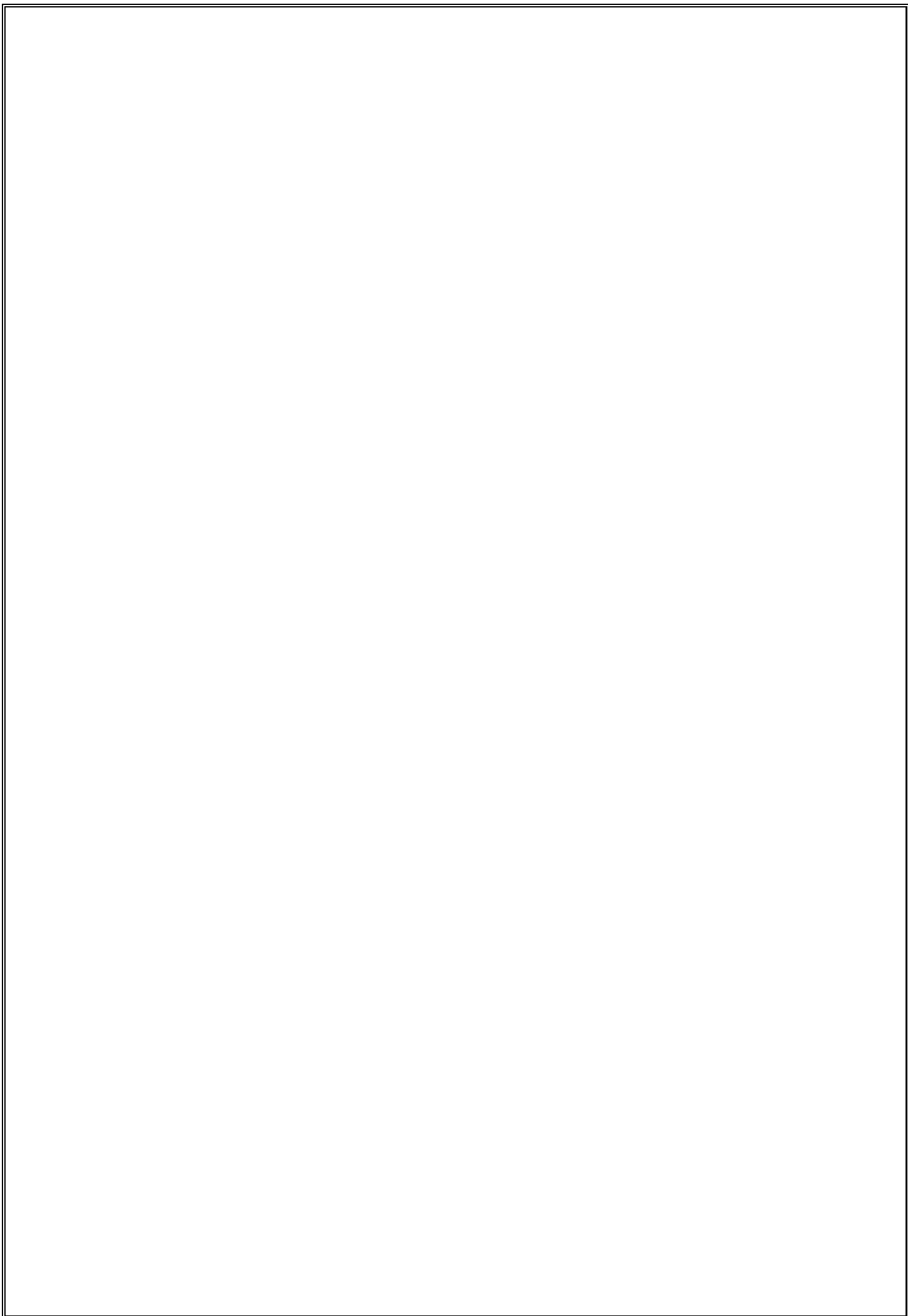


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CHAPTER ONE

COURSE INTRODUCTION



CURRICULUM

This course focuses on Reproduction, Genetics and Breeding of dairy animals.

Delivery of this course will take one day. This includes practical exercises.

The curriculum summary

The following is a summary of sessions and the duration each session will take.

Session		Time taken
Introduction to SAGP-L Training	Introduction to SAGP-L Training	01h00
Breeding Management	Factors that influence productivity in dairy cattle and buffaloes	00h30
	Selection and culling	00h30
	Preparing for breeding	00h45
	Feeding for breeding	00h30
Heat detection	Early signs of heat	01h00
	Signs of standing heat	01h30
Insemination methods	Natural	00h30
	Artificial insemination	01h00
	Common causes of infertility	00h30
Calving management	Preparation for calving	01h00
	Calving	01h00
	Cow Problems during and after calving	01h30
Reproductive management of dairy animals		00h45

SESSION 1. Introduction to SAGP-L Training



1h00

Session Objectives	<p>Introduce the training to the participants including contextualizing the project:</p> <ul style="list-style-type: none">• To ensure that participants are clear how their work embeds with the overall objectives of the program• To ensure workshop objectives are clear• To identify needs and concerns of participants through sharing expectations• To introduce participants to each other• To establish trust and respect through agreeing on ground rules
Session Topics	<ul style="list-style-type: none">• Introductions• Project brief• Training objectives• Setting ground rules
Resources required	<ul style="list-style-type: none">• Flip chart to write ground rules• Sticky notes for participants to suggest ground rules

ACTIVITY I: Introductions and establishing training ground rules

THE NAME GAME & GROUND RULES

- What is your name
- Which one animal do you admire and why
- On a sticky note, suggest two ground rules you'd like all participants to follow in this workshop

ACTIVITY II: Introduce the conversation and scenario approach of this training

OFFICER ISMAIL AND FARMER DAWUD

- Dawud is a small holder dairy farmer who wants to improve his animal's production through improved breeding management
- Ismail is a government vet who will advise



Dawud has been a small holder dairy farmer for years and is interested in improving his production and profits from his small farm



Ismail has a government veterinary officer, he has worked with the community for a long time and understands the difference good animal management can make.

Explain to participants that the training approach will often be in the form of a conversation between a farmer and his extension officer.

CHAPTER TWO

ANIMAL REPRODUCTION AND BREEDING MANAGEMENT



SESSION 1. Animal Reproduction & Breeding Management



Use Annex 1 for District staff trainers and Annex 2 for Field staff & Farmers



1h00

Session Objectives	By the end of the workshop the participants will be able to: <ul style="list-style-type: none">• Describe the attributes they'd like to see in their dairy cattle• Explain what they need to do get offspring that meet their production demand and are within the farmer's ability to care for• Explain the difference between culling and selection including their objectives
Resources required	<ul style="list-style-type: none">• Session handout photos• Dawud and Ismail image flash cards

ACTIVITY I: Introduction and definition of ruminants

Cattle Reproductive System

What are the basics of cattle reproductive system?



Information on factors that influence productivity in dairy cattle

- Health - Animal health management is important, and farmer needs to have a disease identification and treatment strategy. Poor health management not only leads to low productivity but can also lead to loss of animals through death.
- Nutrition - A dairy cow requires high quantity of good quality feeds. Feeding constitutes about 60% of milk production costs. It is important to consider the following:
 - Knowledge of your feed requirements - i.e., milking cows have very high nutrient requirements, therefore high-quality forages and concentrates are essential for profitable dairying.
 - Quality/type of feed
- Genetics - the production potential of a dairy cow is determined by her genetic makeup. Select the breed that meets your objectives and matches your production environment. Some important consideration when making breeding decisions include:
 - Level of production
 - Desired traits e.g, udder conformation, legs & feet, tempérament etc.
 - Production environment



Selection

- Selection is the process of allowing certain animals to be parents of future generations while culling others. Selection is used as a tool for livestock improvement. It helps improve characteristics which are highly heritable
- When selecting, consider:
 - Milk yield
 - Fat content (Breed Character)
 - Length of lactation period
 - Age of the animal
 - Fertility (Repeat Breeders)
 - Health of the animal
 -



Culling

- Culling is the removal of unproductive animals which do not perform to the desired level, from the herd
- When culling, consider:
 - Milk yield
 - Low Milk yield
 - Decrease in lactation period
 - Reproductive Disease (Brucellosis Metritis, Endometritis, Pyometra) etc.
 - Increased age of animal
 - Body conformation
 - Physical Fitness



What is the importance of good breeding management?



The farmer has asked a very good question, let's look at the importance of good breeding management at your farm. decision.

- Higher average daily milk yields are attained
- Higher persistency
- Length of lactation/Lactation period
- High fertility (fewer inseminations/pregnancy or conception).
- Low disease incidence in animals (Brucellosis, Trichomoniasis and Vibriosis)



Preparing for breeding - Body condition score (BCS) and breeding

- Body condition score - check the body condition score of the cow is correct for breeding throughout pregnancy. It is too late to correct BSC in the last trimester of pregnancy. Heifers should be at least 280-300kg at first breeding to minimise risk of difficult calving.

Effects of Body Score Condition (BSC) on reproduction

Too thin	Too fat
Will not cycle	Expensive waste of feed
Will not conceive	May not cycle, may not conceive
Increased days to oestrus	More chances of dystocia
Longer intervals between calves	More chances of metritis
Poor milk production	Lower colostrum and milk production
Weaker calf	Less mobile, more heath stress

Feeding for breeding

- Diet for breeding cows - breeding cows need a different diet to animals being fattened. Their ration needs:
 - energy level appropriate to BCS
 - higher minerals (Ca and P)
 - higher roughage
 - more protein in late pregnancy as the calf develops



Thin cows produce less milk and will not get back in calf.

When cow is too fat



Reduce the amount of energy fed to a penned cow before she gets too fat or give her more exercise.

More chance of dystocia

Cows overfed in late pregnancy produce large calves, while fat deposits reduce the size of the pelvic canal. Excess fat also absorbs key hormones involved in birth and results in weaker signals to the uterus.

SESSION 2. Heat Detection



1h30

Session Objectives	By the end of the workshop the participants will be able to: <ul style="list-style-type: none">• Describe early signs of heat• Describe standing heat• Describe signs of being out of heat• Describe when to mate or serve the cow
Resources required	<ul style="list-style-type: none">• Session handout photos

ACTIVITY II: Signs of heat

Efficient heat detection is extremely important as it makes it possible to serve the animal at the right time, reduces calving intervals and overall productivity



Early signs of heat - watch the cow closely

- Detecting oestrus can be difficult in *Bos indicus* cattle as many cycle during the night, while tethering cows means they cannot mount.
- Signs that a cow is coming into heat:
 - restlessness
 - bellowing
 - nudging and resting chin on other cows
 - sniffing genital area of other cows
 - wrinkling its nose and curling its lip
 - swollen red vulva with mucus discharge
 - frequent urination



Signs of standing heat - time to mate the cow

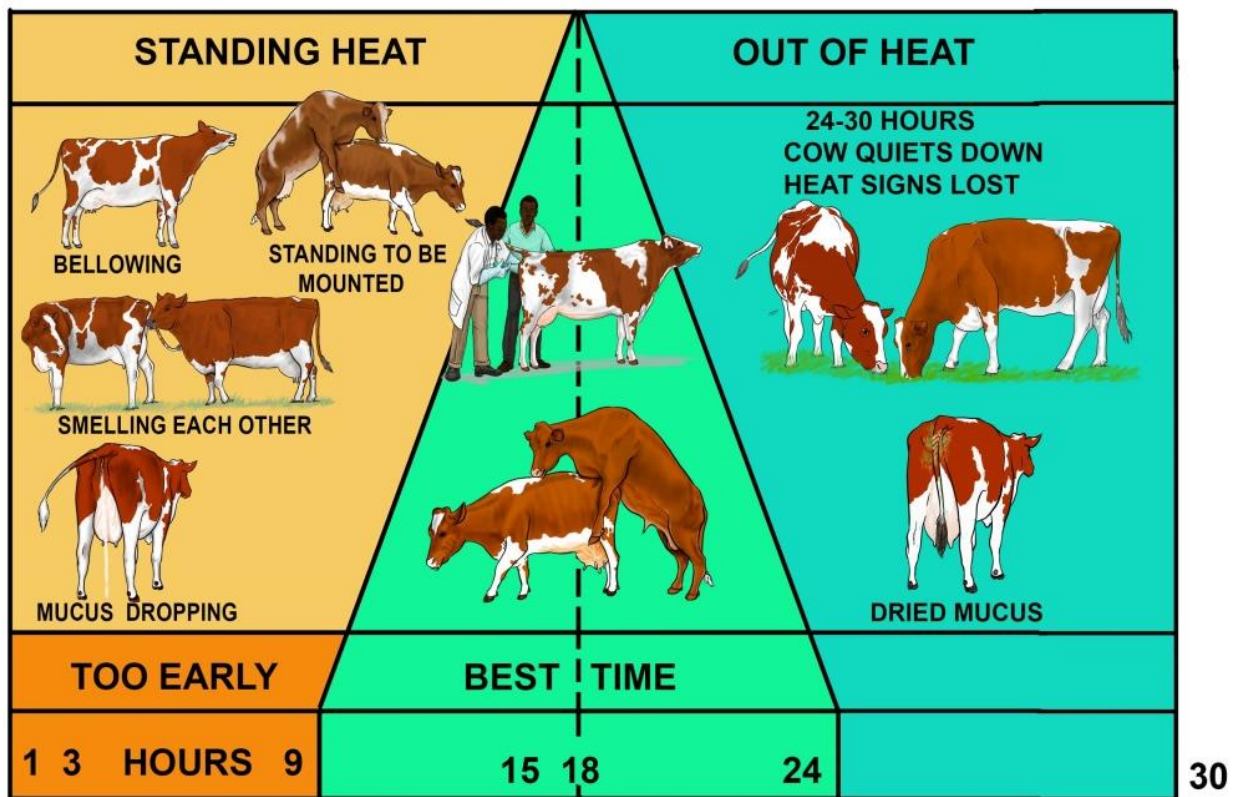
- Standing heat is the most reliable sign of oestrus and is when she should be mated.
- While the other signs may be seen during the start of her heat period, the only sure sign of when to mate her is standing heat.
- Signs during standing heat:
 - early signs continue
 - stands to be mounted by another cow
 - thin, clear mucus discharge from vulva
 - mucus smeared over the pin-bones & tail area
 - reduced appetite
 - sharp decline in milk production
 - animal may stop eating
- Record these dates or mark the date on a calendar



Clear mucus discharge

- Signs of coming out heat:
 - no longer stands to be ridden
 - muddy flanks and roughened tail head from being mounted
 - dried mucus below vulva and or on the tail

****too late for mating****



- IF STANDING HEAT IS OBSERVED IN THE MORNING SERVE THE ANIMAL LATE AFTERNOON THE SAME DAY
- IF STANDING HEAT IS OBSERVED LATE AFTERNOON SERVE THE ANIMAL NEXT MORNING THE FOLLOWING DAY

SESSION 3. Insemination Methods



1h30

Session Objectives	By the end of the workshop the participants will be able to: <ul style="list-style-type: none">• Understand and explain the various ways of inseminating a cow• Understand and explain the advantages and disadvantages of natural and AI
Resources required	<ul style="list-style-type: none">• Session handout photos• Dawud and Ismail image flash cards

ACTIVITY III: Mating

What are the two ways a farmer can serve his or her cow and which is better?



Inseminating the cow

Natural mating

- Take the cow to the bull as soon early signs of heat are detected.
- Keep the cow with the bull for up to 5-6 nights to make sure the 12 hours of standing heat are covered.
- Then bring her back 18-21 days later for the bull to detect a heat.
- If no heat, she conceived at the first mating.

Artificial insemination

- AI offers better sires than the 'local village bull', and even different breeds.
- The AI technician inseminates the cow but she must be on standing heat.
- After insemination, keep her in the yard away from any bull for about 48 hours.
- If the cow returns to oestrus about 21 days later, she can be inseminated again or mated to a 'local' bull.

Repeat mating

- Re-mate all heifers and cows 18 days after last standing heat, and leave them with the bull for 5 days.

Mating after calving

- To produce a calf every year, the cow must get pregnant again within 75 days after calving.
- The first heat after calving should come at about 36 days, but conception rates are likely to be low.
- It is better to re-mate the cow on the second heat after calving.
- A cow in poor condition may not have a second oestrus cycle until she has gained more weight or the calf weaned.
- After mating, record the date. Observe her for heat signs 18 to 24 days later and again 18 to 24 days after that.
- If she misses two heat periods, she should be pregnant.

- If she is not pregnant, she may have a reproductive disorder.
- If she misses two heat periods, she should be pregnant.
- If she is not pregnant, she may have a reproductive disorder.



How do I select the right bull for my cow or semen during AI



The farmer has asked a very good question, let's look at the factors to consider when making this decision.

KEY MESSAGES

- The farmer's best chance of improving his/her herd is by selecting the right bull for his/her herd. The right bull is the one that builds on the positive attributes at the same time overcomes the negative attributes in his/her herd. The following traits are considered:
 - Milk yield per lactation
 - Fat percentage (%)
 - Protein percentage (%)
 - Lifespan (lactations)
 - Somatic Cell Count (%)
 - Fertility Index (calving interval, conception rate)
 - Persistency (%)
 - Calving Ease



Common causes of infertility

Poor nutrition

- Cow is too thin or too fat (see pages on body condition and feeding)

Metritis

- Metritis has been treated but uterus still damaged

Previous uterine or cervical prolapse

- Uterus has not recovered.

Physical defects

- The cow cannot stand the weight of the bull because of leg or hoof injuries.
- The hooves of cows permanently penned on soft ground grow too long and may need trimming.

Bacterial and viral infections

- Leptospirosis Bacterial infection spread by urine and direct contact. It can cause abortion and can infect humans, but can be prevented by vaccination.
- Brucellosis Pregnant females with brucellosis will abort a foetus about 3-6 months after conception. It is spread by birth fluids and discharge and can infect humans. Vaccinate heifer calves at 6-8 months to control the spread of brucellosis.

- Vibriosis 'Vibrio' is a venereal disease that causes temporary infertility, particularly in heifers. However, they will keep returning to the bull for mating. Only about 5% of the herd will abort. Bulls remain infected for life, but heifers and bulls can be vaccinated.
- Infectious Bovine Rhinotracheitis (IBR) IBR or 'Red nose' can also be spread by venereal infection. If IBR occurs in last trimester of pregnancy, foetus may be aborted and could be mummified. Any live calf born will be weak.

Seek veterinary assistance if a female keeps returning to service or aborts

SESSION 4. Calving Management



1h30

Session Objectives	By the end of the workshop the participants will be able to: <ul style="list-style-type: none">• Explain how to prepare for calving• Explain the process of calving• Explain possible problems during and after calving for the cow and the calf
Resources required	<ul style="list-style-type: none">• Session handout photos• Dawud and Ismail image flash cards

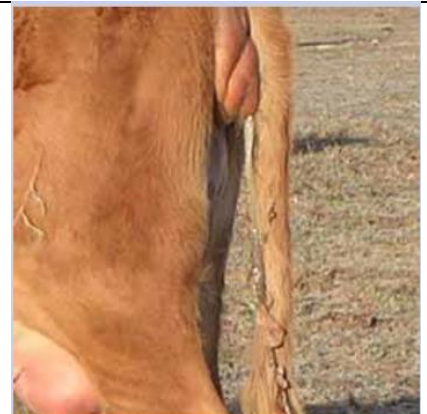
ACTIVITY IV: Calving management

How does a farmer prepare for calving?



Preparation for calving

- Females calve 280 days (275-285) after conception.
- **Signs before calving**
- At 7-10 days before calving, the udder increases in size, the vulva becomes swollen, may change in colour and often discharges mucus.
- The cow should be bedded down on clean straw and disturbed as little as possible.
- Allow the cow to calve naturally but check every 30 minutes.
- Bos indicus cattle generally calve easily.

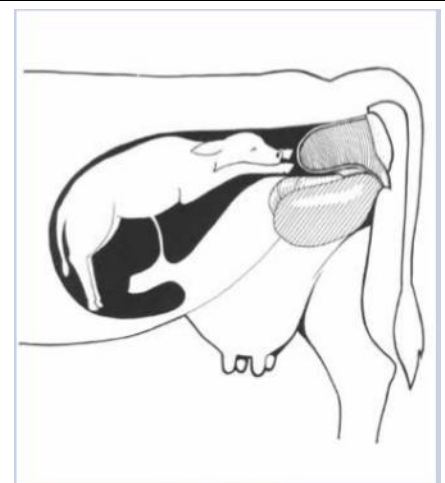


Two hours before calving – mucus from swollen vagina, and a swollen udder.



Calving - The cow archs her back and strains.

- She will lose two bags of water, with the second thicker than the first.
- Within two hours of the second water bag, the calf's two front legs should appear.
- Allow her to calve naturally but check every 30 minutes.
- Avoid handling the calf for the first 12-24 hours to allow early bonding between mother and calf.
- She will lick the calf clean and allow the calf to suckle her.
- The first milk (colostrum) is essential for the calf's immunity. Let it suck for a minimum of 24 hours, preferably 2-3 days.
- Treat umbilical cord with iodine to prevent infection.



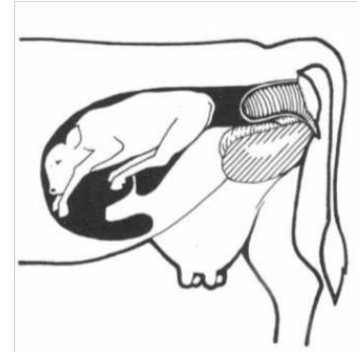
Normal position of calf



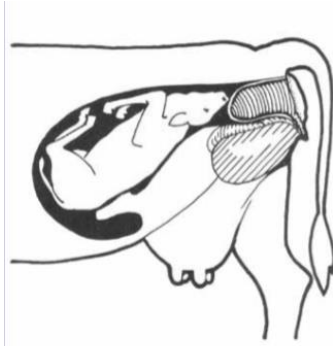
Cow Problems during and after calving

Dystocia

- If the front legs do not protrude within 2-3 hours, the calf may be turned in the womb.
- If the calf is only turned, it can often be turned back so that its spine aligns with that of the mother, and then pulled out the normal way, front legs first.



Problems at calving – breached calf



Problems at calving – turned calf

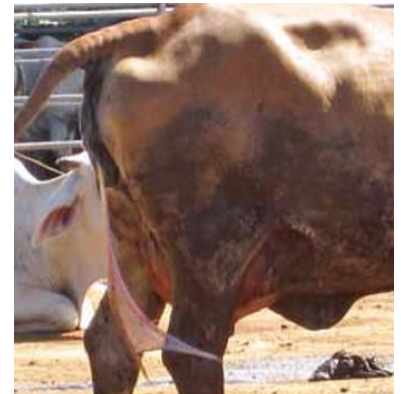
- If only one front leg is protruding, push the head back, then bring both legs forward.
- If the head is turned sideways, push the calf back, then bring the head and forelegs into the normal delivery position.
- If the calf is facing backwards in the womb with its legs underneath, it may need a caesarean section. If the legs are protruding, pull the calf out quickly so that it does not suffocate. • If the calf is born dead, clean the cow up immediately. If she is sick, give antibiotics for 3 days and an intrauterine bolus (Terramycin) or an intrauterine infusion.

Retained placenta

- Retained placenta ('afterbirth') - the placenta is 'retained' if not expelled within 24 hours of calving.

Treatment

- If the placenta does not come away naturally, do not try to pull it out as this can cause a haemorrhage and the cow could bleed to death.
- Check 12-24 hours later and, if necessary, leave for another day.
- Treat with antibiotics and seek veterinary assistance.



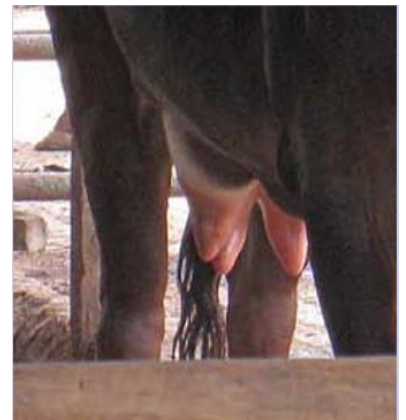
A retained placenta after giving birth

Mastitis

- Mastitis is an infection of the udder.
- The teat swells, and the calf cannot suckle enough good milk and will grow poorly.

Treatment

- Rope the cow's hind legs together to prevent her kicking.
- Milk the teat dry and inject the entire content of a tube of antibiotic directly into the teat canal.
- Seek veterinary assistance as to the best antibiotic to use.



Udder with mastitis showing inflamed and swollen teats

Metritis

- Infection of uterus at the time of calving due to dirty calving area and contamination of environment.

- Cows with high BCS are more susceptible because of prolonged calving.
- Off feed, lethargic and mild vaginal discharge within 7 days of calving, progressing through high temperature, straining, and dark coloured foul-smelling vaginal discharge. Untreated cows will die.

Treatment

- Treat immediately discharge or foul smell is noticed with high doses of antibiotics (eg long-acting intramuscular injection of oxytetracycline and uterine pessaries) and prostaglandin.
- Move cow from general breeding herd to treatment pen.

Prevention

- Use clean calving area.
- Feed for correct BCS (3) at calving for ease of calving



Unhygienic conditions during birth increase the risk of metritis in the cow and infection in the calf.



Calf Problems during and after calving

Pneumonia

- Pneumonia is caused by overstocked and contaminated calving areas and calf pens.
- Pneumonia is also caused when calves are not receiving natural immunity through suckling colostrum from the cow over the first 2-3 days of life, but especially first 24 hours.
- The main signs are mild nasal discharge progressing to difficult breathing, dehydration and once calf lies down, mortality is often guaranteed.

Prevention through management

- Maintain clean area for calving and calf rearing.
- Allow the calf to suckle colostrum from mother for at least the first 24 hours of life.

Treatment

- Remove the calf to the hospital pen as soon as respiratory signs are seen.
- Inject Ceftiofur (Excenel) intermuscular for 3 days.
- Inject non-steroid anti-inflammatory drugs for 3 days.
- Give 2 litres of electrolyte solution followed by 2 litres calf milk replacer, 4 hours apart, morning and night.
- If calf does not actively suck fluids or milk, give through stomach tube.
- Keep calf in hospital pen until symptoms finish and then return to general calf area.
- If calf does not respond, transfer it to a chronically infected pen.
- Vaccinate cows with Bovilis MH before they calve.
- Seek veterinary assistance.



Pneumonia – nasal discharge

Scours

- It manifests as mild diarrhoea progressing to severe diarrhoea, the calf becomes dehydrated and once calf lies down, mortality is guaranteed.
- Scours is caused by overstocked and contaminated calving areas and calf pens.
- It's also found on calves that are not receiving natural immunity through suckling colostrum from the cow over the first 2-3 days of life, but especially first 24 hours.

Prevention through management

- Maintain clean area for calving and calf rearing.
- Allow the calf to suckle colostrum from mother for at least the first 24 hours of life.

Treatment

- As soon as symptom of scouring is seen, remove calf to hospital pen to reduce spread of disease, and stop feeding milk.

Day 1. Give only electrolyte solution with added bicarbonate (2 litres every 4 hours).

Day 2. Move calf into clean pen and give 2 more doses of electrolyte in the morning. Clean and disinfect the previous pen.

Day 3. Give 2 litres of electrolyte solution followed by 2 litres calf milk replacer, 4 hours apart, morning and night.

- If calf does not actively suck, give fluids through stomach tube.
- Keep calf in hospital pen until scouring stops, then return to general calf area.
- If calf does not respond, transfer to a pen for the chronically infected.
- Vaccinate cows with Bovac and Bovilis S before calving.
- Seek veterinary assistance.



Calf scours

SESSION 5. Reproductive management of a dairy animal



1h30

Session Objectives	By the end of the workshop the participants will be able to explain the main reproductive management practices of a dairy animal.
Resources required	<ul style="list-style-type: none">• Session handout photos• Dawud and Ismail image flash cards

ACTIVITY V: Culling and selection

Key reproductive management practices that the farmers needs to focus on in order to achieve high productivity of their dairy animal and profitability of the dairy farming.



Why is it important for me to maintain a high reproductive performance in my heard?



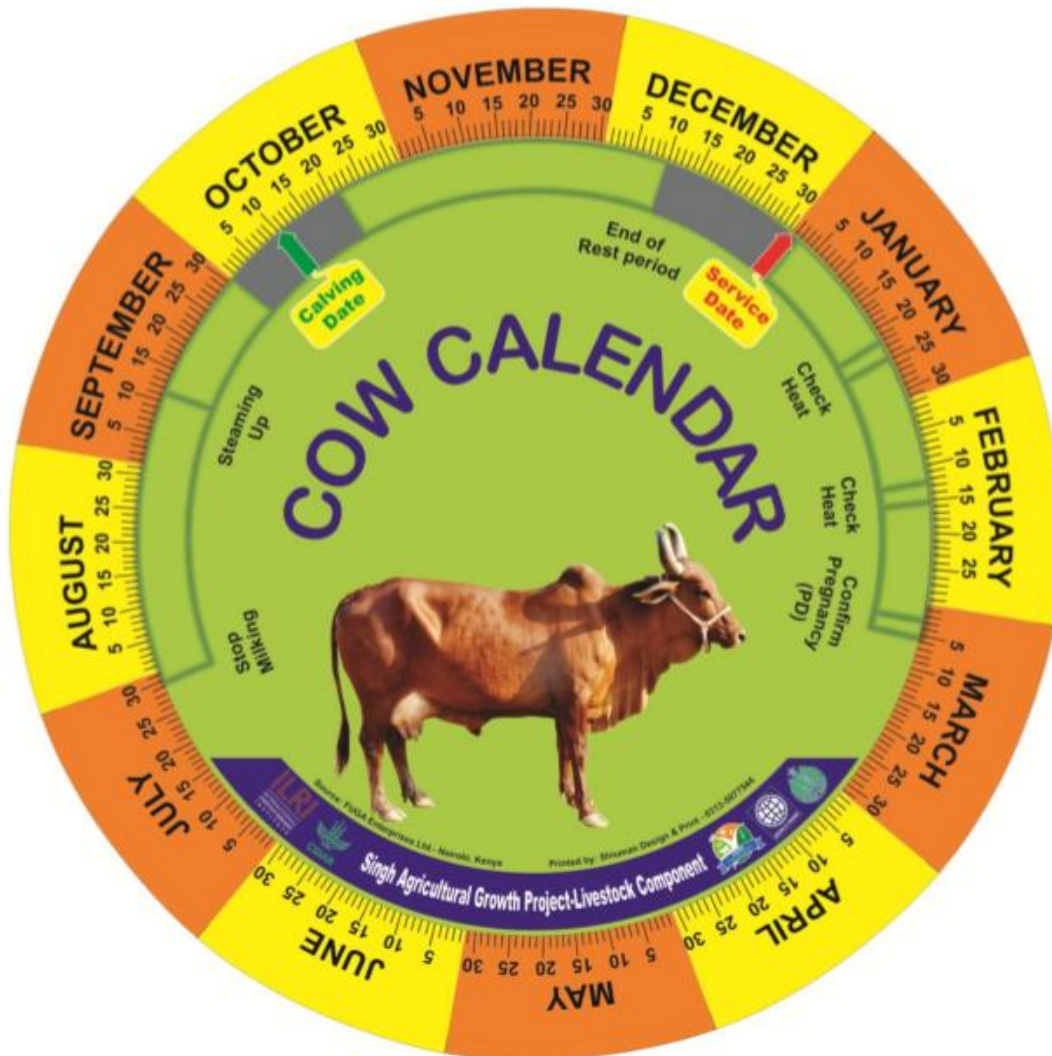
The farmer has asked a very good question, let's look at the importance of maintaining a high reproductive performance in the heard.

KEY MESSAGES

- Timely breeding of the Heifer / Cows will results in more calvings and more milk production.
- Heifers calve down at a younger age, mature weight, hence they have a longer productive life.
- Good reproduction under well nutrition will result in regular calving (One calf in a year).
- It results in reduced insemination and semen costs.
- It results in increased number of calves produced each year, thus providing more animals for sale or as replacements for the milking herd.










The reproduction cycle of a dairy cow



ACTIVITY VI: Using the example below demonstrate how to use the breeding chart.

Example: For a milking cow service date is 01st January and calving date is 11 October.

Service Date (Red arrow)	Check heat on every 21 days for 2 months	Confirm Pregnancy after 3 Months	Stop Milking (For last 2 months before calving)	Steaming Up (Last 1 month before calving)	Calving Date (Green Arrow)	End of rest period (Ready for next service after 2 months)
						
01 st January	22-24 January & 14-16 February	2-6 March	30 July up till calving	13 September up till calving	11 Oct (± 5 to 10 days)	11 December

Training materials

Annex 1: Trainer PowerPoint presentation - District Staff

Annex 2: Trainer Flexes Presentation - Farmer Groups

Annex 3: Guide to use 'Cow Calendar'

Annex 1: Trainer PowerPoint presentation - District Staff

Sindh Agricultural Growth Project

Reproduction and Breeding



What do farmers need to know to effectively deal with the above complex issues?

What are the ultimate desired outcomes

- Increased understanding of the key reproductive and practical breeding issues by farmers
- Better match of genetics to production environments (*No one size fits all!*)
- Better support by extension and breeding service providers
- Increased access to input services and markets
- Increased productivity and profitability

The Components

- Reproduction
- Farm records-why identify animals & why keep records?
- Genetics and Breeding



5

Why keep and use records?

- Help to keep track of all animals - their identities, breed, sex, parents etc.
- Inform decisions on which animals to cull, retain for breeding and to sell
- Keeping track of diseases, their occurrence and about treatment
- Manage the farm resources (labour, equipment, time, infrastructure) and costs.
- Decide what feeds & other inputs to use, why and how much?
- Assess if the farm is making profit or loss.
- Build a strong case to qualify him/her to access credits.



6

What records and how to measure?

What records?:

Key life events:

- Birth/calving dates
- Reproduction-dates/IDs & by whom?
- Treatment /vaccination types and dates
- Weights-monthly
- Milk yield-Monthly
- Exits-death/predation/sales
- Feeds consumed per herd/animal
- Expenditures-amount & dates

How to measure & why?

- ??
- ??
- ??
- ??
- ??
- ??
- ??
- ??

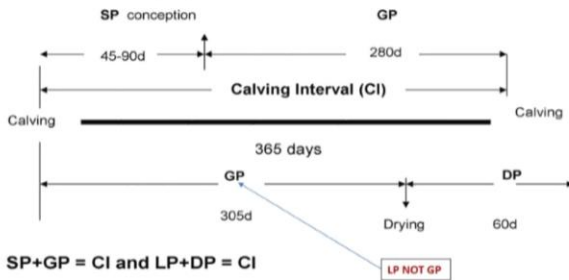
7

Reproduction events, the common problems and how to deal with them

8

Breeding management-reproduction events

Key reproductive events- cow calendar



9

What are the likely causes of the following & what are Consequences and what are the solutions?

Heifer is not growing fast enough!

Heifer is growing too fast!

What is the recommended age at 1st breeding for dairy cattle?

Cow not showing any obvious heat signs!

Cow inseminated more than 3 consecutive times and doesn't conceive!

10

Type of breeding services

Natural service



Artificial insemination



Embryo transfer

11

Stages of heat manifestation-the signs in cows

Early heat	Standing heat	After heat
The cow is nervous/restless, eat less and may bellow	Standing to be mounted Clear mucus discharge	Dried mucus on the tail Roughened tail head
Sniffing, licking and mounting other cows	Sharp decline in milk production	The animal refuses to be mounted
Swollen vulva with mucus discharge	Tail bent away from the vulva The animal may stop eating	Streaks of saliva or signs of leaking may be seen on her flanks
Early signs: Watch the cow closely from now on!	Best signs: Take the cow for service if showing these signs	Late signs: Keep record but don't serve the cow!

12

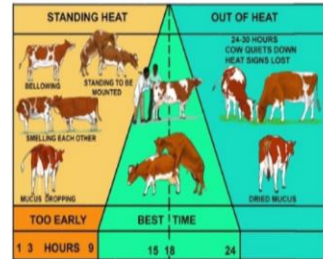
Stages of heat manifestation-the signs in buffalos

Early heat	Standing heat	After heat
The buffalo is nervous/restless, eat less and may bellow?	Standing to be mounted	Dried mucus on the tail
Sniffing, licking and mounting other females?	Clear mucus discharge?	Roughened tail head
Swollen vulva with mucus discharge?	Sharp decline in milk production?	The animal refuses to be mounted
	Tail bent away from the vulva	Streaks of saliva or signs of leaking may be seen on her flanks
	The animal may stop eating	
Early signs: Watch the buffalo closely from now on!	Best signs: Take the cow for service if showing these signs?	Late signs: Keep record but don't serve the buffalo!

Describe each of these stages for the buffalo

13

Suggest how each of the events can be illustrated better!



- IF STANDING HEAT IS OBSERVED IN THE MORNING SERVE THE ANIMAL LATE AFTERNOON THE SAME DAY
- IF STANDING HEAT IS OBSERVED LATE AFTERNOON SERVE THE ANIMAL NEXT MORNING THE FOLLOWING DAY

What are the differences between heat signs in cow and in buffalo?

Develop close-up photos of:
a) clear mucus discharge &
b) dry mucus on tail for reference

14

What to record at insemination

- Cow ID (unique identification needed!)
- Date and time of insemination
- Inseminator details (name/Reg #, Telephone contacts)
- Site of semen deposition (uterus/cervix/vagina)
- Semen used (bull ID, breed and batch)
- Cow body condition score
- Date of pregnancy diagnosis (PD) and result

15

Breed improvement: How to improve?

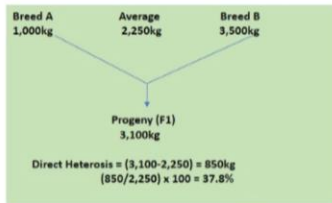
1. Crossbreeding

When to cross breed

When not to crossbreed

16

How to improve genetic potential



17

Earlier attempts to synthetic breed formations



It is easy to increase the milk yield of a zebu breed by crossing with a European dairy breed; the difficulty has been how to maintain heterosis in later generations:

- Extensive system of milk & other trait recording needed
- Robust genetic evaluation system
- Efficient delivery of improved genetics (i.e. good artificial insemination service).

Better genomic, reproductive technologies & IC tools now exist which can innovatively be used to effectively address the above challenges



Breed improvement: How to improve?

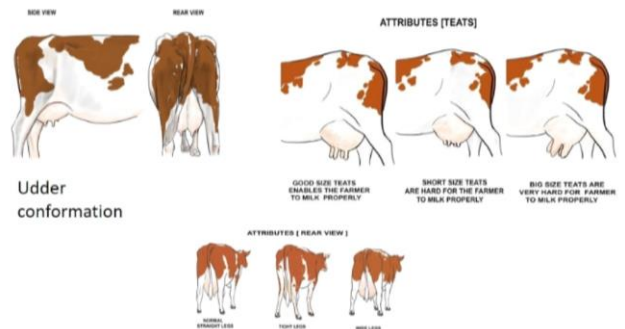
2. Within breed/population selection

Culling = selection

What are the attributes that farmers want to improve and why?

= Breeding objectives!

19



20

Fertility and other attributes and why?

Fertility:

- Age at 1st calving
- calving interval (number of inseminations per conception)

Other important attributes:

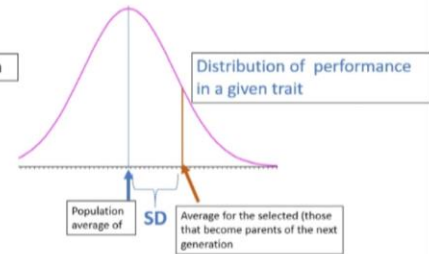
- Calving ease
- Temperament
- Longevity

21

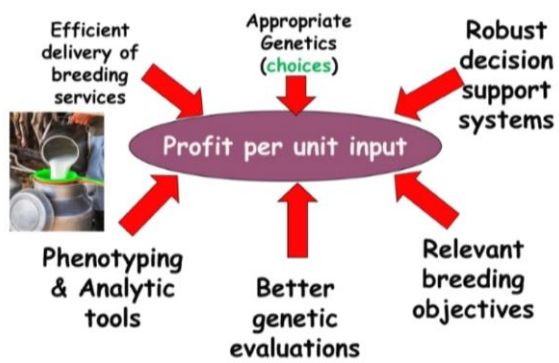
Breed improvement methods:

Within breed selection

When to practice selection



22



23



Annex 2: Trainer Flexes Presentation - Farmer Groups

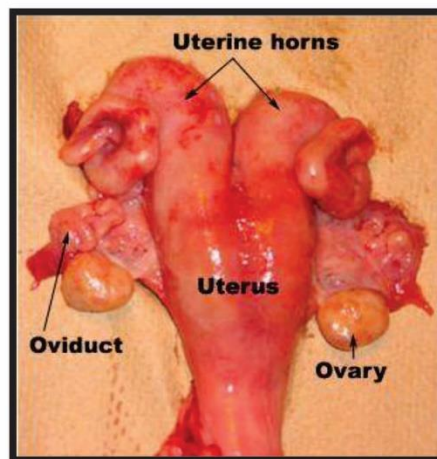
Sindh Agricultural Growth Project-Livestock Component

Animal Breeding, Reproduction and Genetic Improvement

Session-1: Animal Reproduction

Session-2: Animal Breeding

Session-3: Animal Genetics

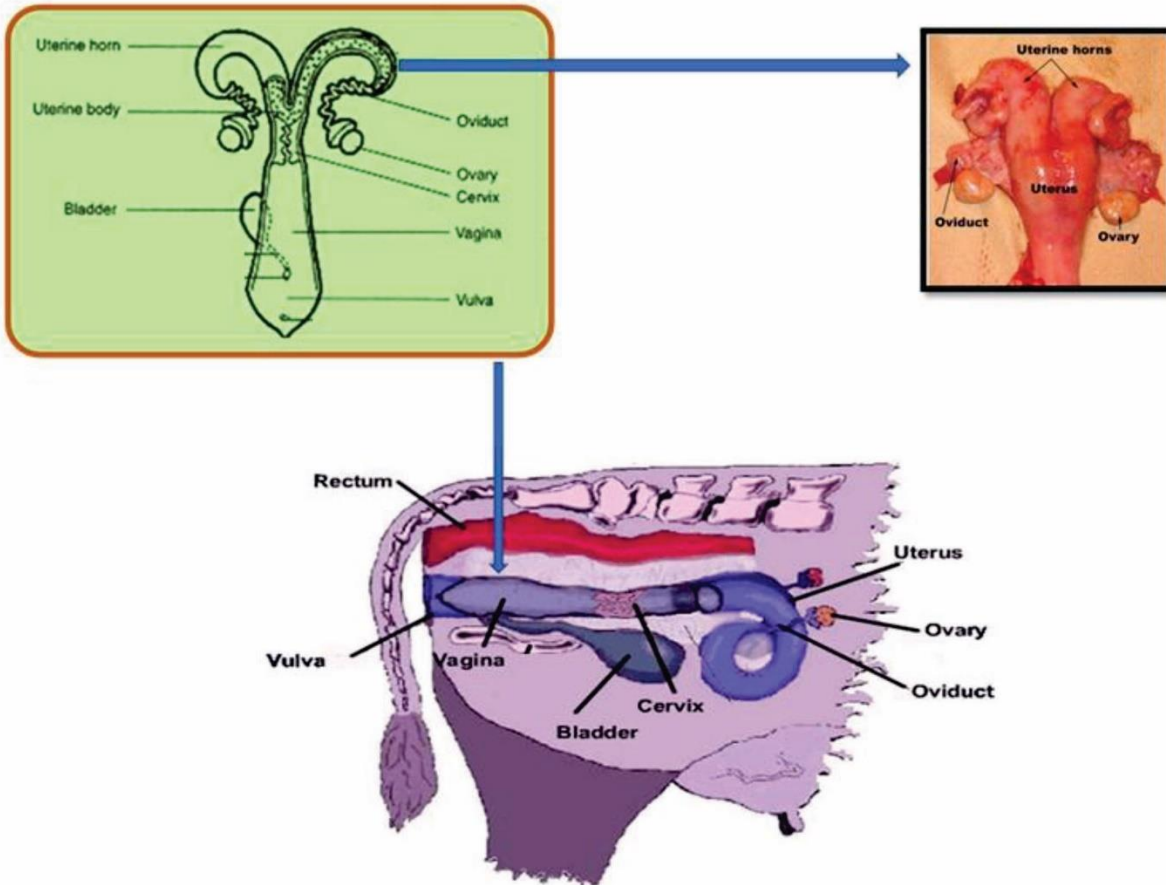


better lives through livestock

Sindh Agricultural Growth Project-Livestock Component

REPRODUCTIVE TRACT OF ANIMAL

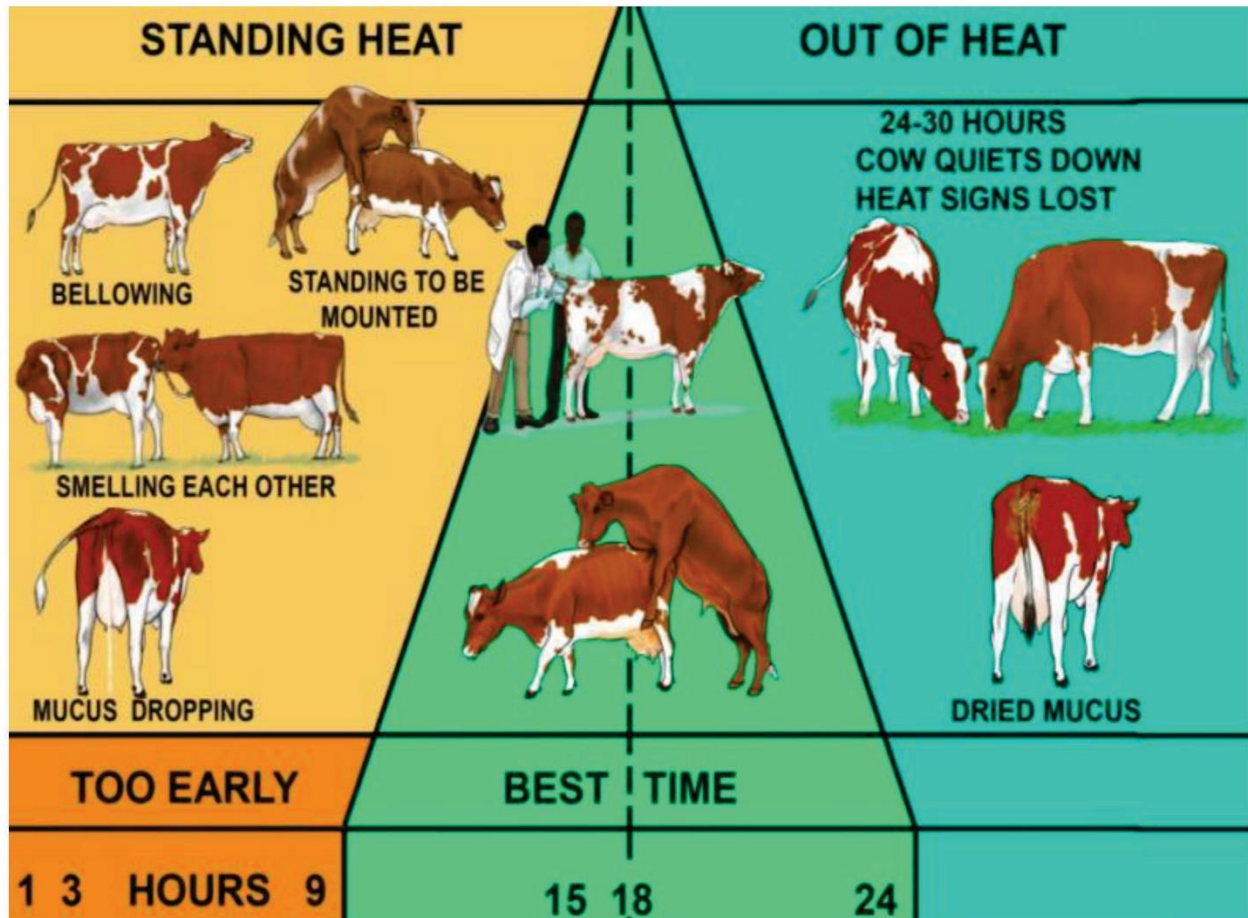
The reproductive tract of a cow is composed of the vulva, vagina, cervix, uterus and ovaries.



Sindh Agricultural Growth Project-Livestock Component

HEAT DETECTION IN CATTLE/BUFFALO

Estrus (Heat): Period of time when the female is receptive to mounting and will stand to be mounted by another animal (standing heat).



***With Buffaloes:** Signs are mounting, frequent urination and silent heat.

➤ *You can make defined "Calving interval" by timely heat detection and appropriate time of insemination in the cow/buffalo.*

Sindh Agricultural Growth Project-Livestock Component

INSEMINATION METHODS

Natural Mating: This is where the animal is taken to a bull and left for some time for bull to serve.



The chances of conception through natural mating can be increased by:

- Taking the cow to the bull as soon as it is detected to be in heat.
- Mating young inexperienced heifers with old experienced bulls.
- Mating young inexperienced bulls with old experienced cows.
- Keeping the bull fit and in good health.

Artificial insemination (A.I)- This is the process of putting semen into a cow's uterus or cervix using an insemination gun to make it conceive instead of using a bull.



Advantages of Artificial insemination (A.I):

- | | |
|---|--------------------------------|
| 1. A healthy bull, that is disease free | 2. Produce high quality semen. |
|---|--------------------------------|

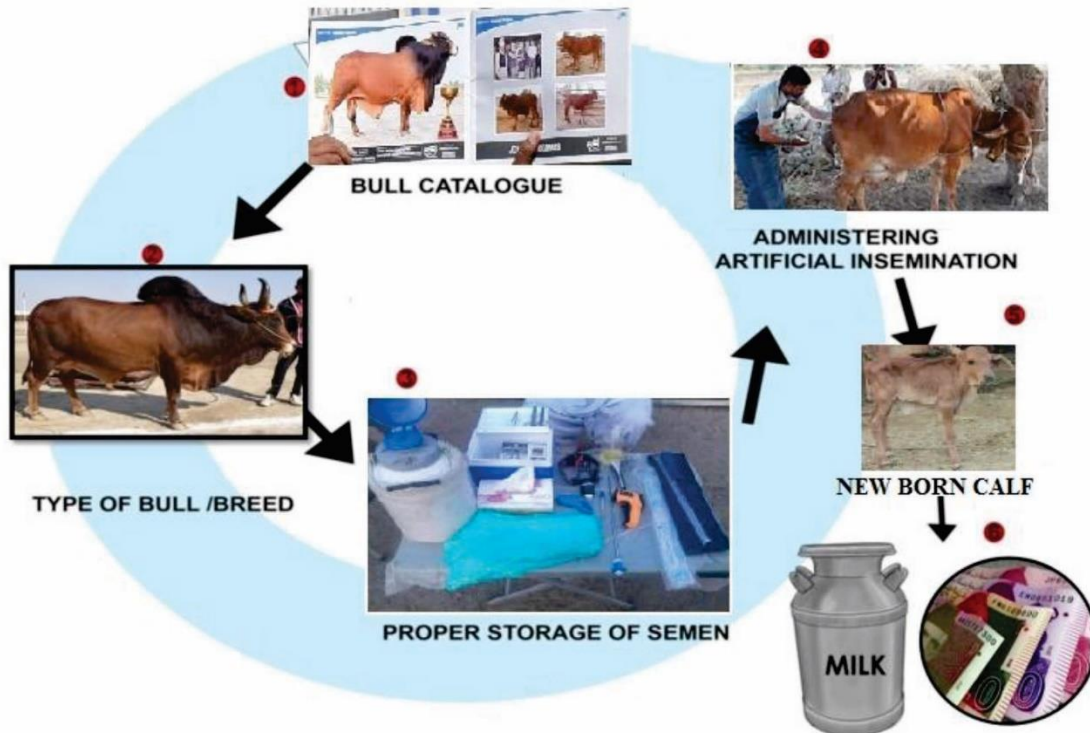
Uses of Artificial insemination (A.I):

- | | |
|--|-------------------------|
| 1. Effective semen handling facilities | 2. A fertile animal. |
| 3. A competent inseminator | 4. A clean environment. |

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IMPORTANT ELEMENTS OF A SUCCESSFUL ARTIFICIAL INSEMINATION PROGRAMME

Farmers are encouraged to use semen from proven bulls which is obtained from AI centers and registered service providers.



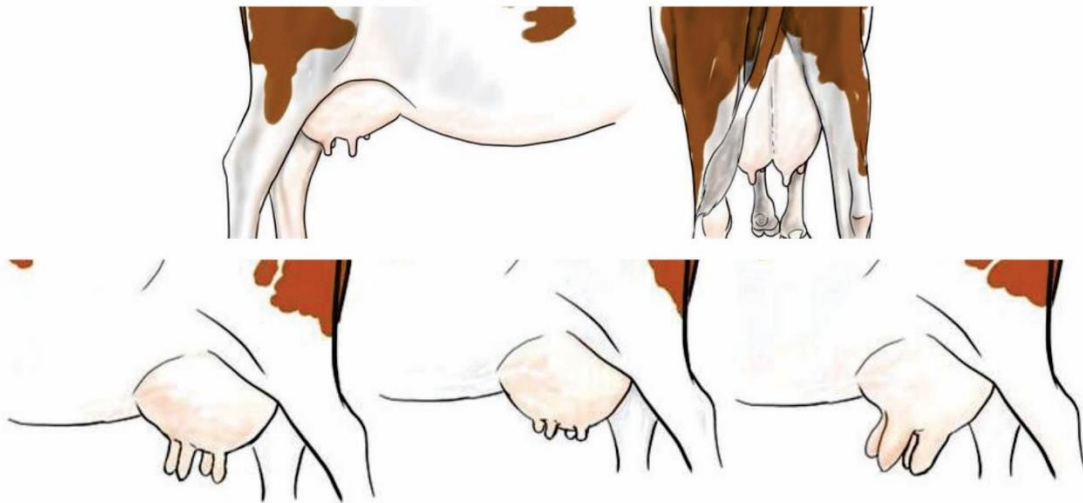
➤ *For controlling the vulnerable diseases and improved genetic makeup is more promising through AI than natural breeding of the animal.*

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CULLING AND SELECTION

Culling and selection is what makes a small scale farmer into a good animal breeder.

Selection: Selection is the process of allowing certain animals to be parents of future generations while culling others. Selection is used as a tool for livestock improvement. It helps improve characteristics which are highly heritable.



Selection in Animals:

Consider the following level of performance which include;

1. Milk yield	2. Fat content (Breed Character)
3. Length of lactation period.	4. Age of the animal
5. Fertility (Repeat Breeders)	6. Health of the animal



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Culling: Culling is the removal of unproductive animals which do not perform to the desired level, from the herd.

Culling in Animals:

Consider the following level which include:

1. Low Milk yield
2. Decrease in lactation period.
3. Reproductive Disease (Brucellosis Metritis, Endometritis, Pyometra) etc
4. Increased age of animal
5. Body conformation
6. Physical Fitness



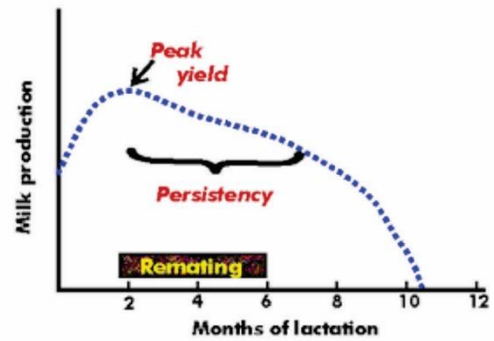
➤ *Selection and culling is the key for profitability in the dairy business.*

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BREEDING MANAGEMENT

Good breeding management ensures:

- ✓ Higher average daily milk yields are attained
- ✓ Higher persistency
- ✓ Length of lactation/Lactation period
- ✓ High fertility (fewer inseminations/pregnancy or conception).
- ✓ Low disease incidence in animals (Brucellosis, Trichomoniasis and Vibrosis)



➤ *The success of a breeding program is highly dependent on adequate nutrition for the cows/heifers, good heat detection, informed choice of bulls and timely insemination.*

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REPRODUCTIVE MANAGEMENT OF A DAIRY ANIMAL

Key reproductive management practices that the farmers needs to focus on in order to achieve high productivity of their dairy animal and profitability of the dairy farming.

Maintaining high reproductive performance is beneficial in many ways:

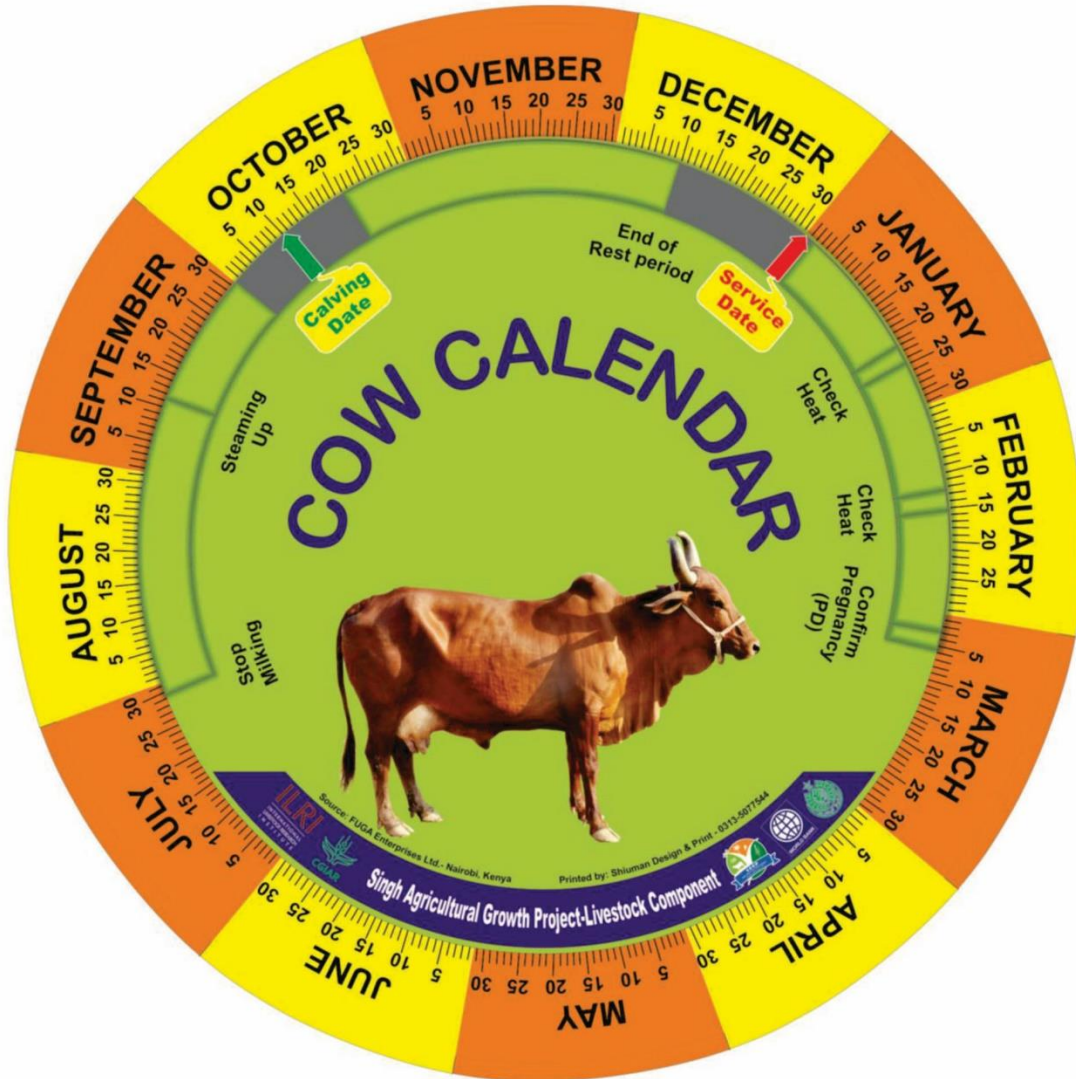
- Timely breeding of the Heifer / Cows will results in more calvings and more milk production.
- Heifers calve down at a younger age, mature weight, hence they have a longer productive life.
- Good reproduction under well nutrition will result in regular calving (One calf in a year).
- It results in reduced insemination and semen costs.
- It results in increased number of calves produced each year, thus providing more animals for sale or as replacements for the milking herd.



➤ *Good reproductive management practices are the key to lead to more profits and less worry.*

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THE REPRODUCTION CYCLE OF A DAIRY COW



➤ You can get one calf in a year by efficient heat detection and timely service.

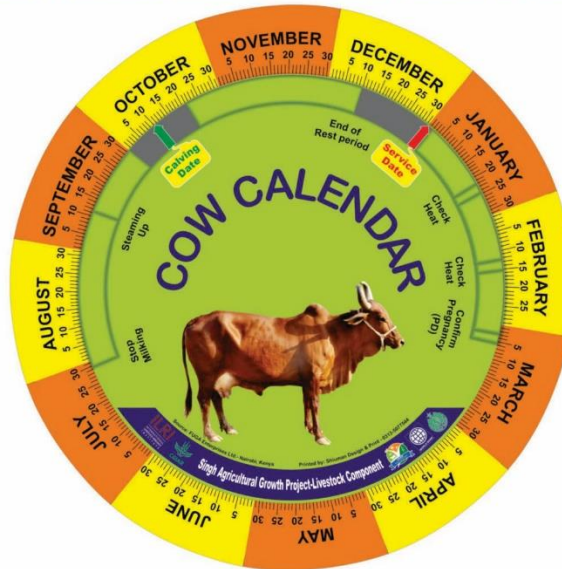
Sindh Agricultural Growth Project-Livestock Component

GUIDE TO USE “COW CALENDAR” FOR MILKING ANIMAL

Introduction

Sindh Agricultural Growth Project-Livestock Component/International Livestock Research Institute (SAGP-L/ILRI) is happy to introduce the “Cow Calendar” for use by small scale dairy farmers. Reproduction cycle of a dairy cow is calculated based on the service date, heat check, pregnancy diagnosis, dry period and calving date.

Guide for the buffalo can also be calculated accordingly with keeping in mind the gestation period.










Step-1: Hold outer round with your left hand. Rotate to the date and month of for service date which appears in the red arrow.

Step-2: Check the heat for 2 times after service date in order to confirm that pregnancy of the animal.

Step-3: After selecting the service date, calendar gives you the option of check heat, confirm pregnancy, stop milking, steaming up and the calving date with green arrow on which you can manage the reproductive cycle of a dairy cow with one calve in one year.

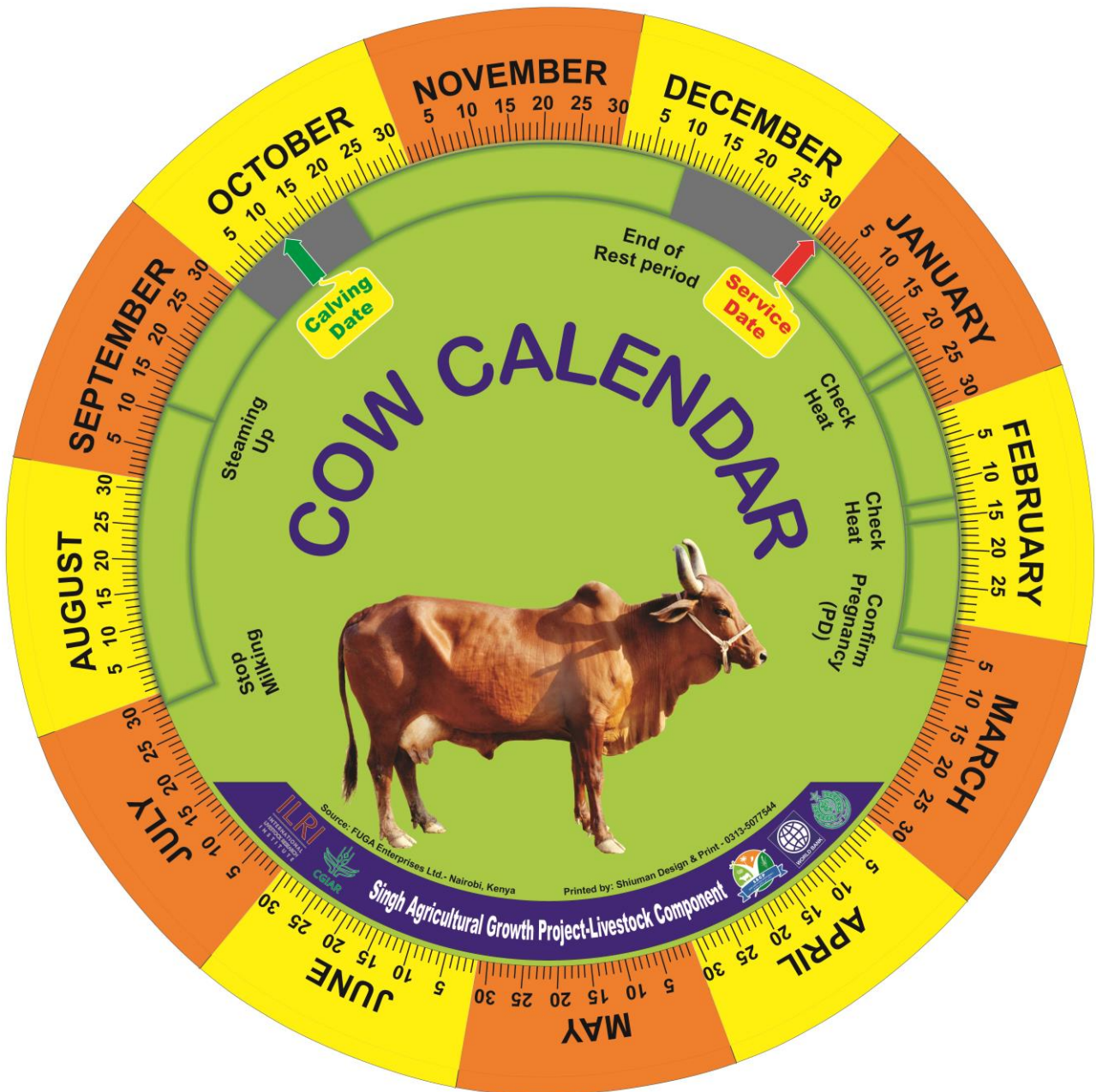
Example: For a milking cow service date is 01st January and calving date is 11 October.

Service Date (Red arrow)	Check heat on every 21 days for 2 months	Confirm Pregnancy after 3 Months	Stop Milking (For last 2 months before calving)	Steaming Up (Last 1 month before calving)	Calving Date (Green Arrow)	End of rest period (Ready for next service after 2 months)
						
01 st January	22-24 January & 14-16 February	2-6 March	30 July up till calving	13 September up till calving	11 Oct (± 5 to 10 days)	11 December

Annex 3: Guide to use 'Cow Calendar'

Sindh Agricultural Growth Project-Livestock Component

THE REPRODUCTION CYCLE OF A DAIRY COW



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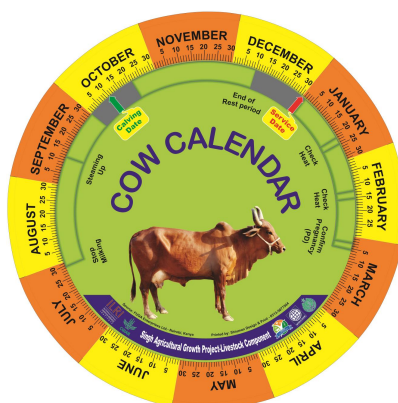
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List of ILRI Publications

Reports, Manuals/Books, Technical/Research publications, Software produced
by ILRI in Pakistan

- (Inquiries on these publications pl contact. Prof. M.N.M. Ibrahim: m.ibrahim@cgiar.org
or mnmi1946@gmail.com)



Reports

- 1 Dairy Value Chain Rapid Assessment: Tools for Participatory rural appraisal with Glossary - English & Urdu Terminologies (ILRI-AIP -Pub:001)
- 2 Dairy Value Chain Rapid Assessment in District of Punjab: Challenges and way Forward (ILRI-AIP -Pub:002)
- 3 Assessment and Evaluation of Constraints faced by Dairy Farmers and Khyber Pakhtunkhwa (ILRI-AIP -Pub:003)
- 4 Baseline Survey Report: Appraisal of Ruminant Livestock Sector in Punjab (ILRI-AIP -Pub:004)
- 5 Compendium of Economically Important Ruminant Diseases in Pakistan (ILRI-AIP -Pub:005)
- 6 Training manual on Modern Reproductive Technologies (ILRI-AIP -Pub:006)
- 7 Livestock Production in Mountainous Regions of Pakistan: A case study on district Bagh, Azad Jammu & Kashmir (ILRI-AIP -Pub:007)
- 8 Rapid Assessment of Small Ruminant Value Chain in Chakwal District, Pakistan (ILRI-AIP -Pub: 008a)
- 9 Small Ruminant Value Chain-Rapid Assessment: Village Level Case Studies from District Bahawalpur, Pakistan (ILRI-AIP -Pub: 008b)
- 10 Participatory Rural Appraisal with Female Livestock Farmers of District Swat, Khyber Pakhtunkhwa (ILRI-AIP - Pub: 009)
- 11 Livestock Farming Systems in Alpine Region of Pakistan: Gilgit- Baltistan and Azad Jammu & Kashmir (ILRI-AIP - Pub: 010)
- 12 Constraints for Long Term Development of Dairy Farming in Sindh and Balochistan: Livestock Management Perspective (ILRI-AIP -Pub: 011)
- 13 Livestock farming systems in Sindh: Challenges and way forward for formation of formal Milk Producer Groups (ILRI-AIP -Pub. 012)
- 14 Fodder Marketing Systems of Punjab: Impediments and Way forward (ILRI-AIP - Pub. 013)
- 15 Inception Workshop Report of the Sindh Agricultural Growth Project. (ILRI-SAGPL - Report 01)
- 16 Report on Training District Livestock Department Staff (DDL, ADL, VO'S, DFM'S, LLS & ILRI NATIONAL STAFF) on Dairy Production Technologies (ILRI-SAGPL - Report 02)
- 17 Report on Training District Field Extension Staff (AI Technicians, Livestock Inspectors, Stock Assistants, Livestock Assistants, LAB Technicians) on Dairy Production Technologies (ILRI-SAGPL - Report 03)
- 18 Report on Training of MPG (153) members on Animal Health Management and Feeds and Feeding (ILRI-SAGPL - Report 04)
- 19 Report on Training of MPG (153) members on Animal Reproduction and Breeding (ILRI-SAGPL - Report 05)
- 20 Report on Awareness Programs conducted in Model MPGs for members & non-members on "Farmer Centered Knowledge Sharing Program on Capacity Building Activities" (ILRI-SAGPL- Report 06).



Manuals/Books

- 1 Judging and Selection in Sahiwal Cattle (ILRI-AIP)
- 2 Judging and Selection in Beetal Goats (ILRI-AIP)
- 3 Nachi Goats: Judging and Selection Guide (ILRI-AIP)
- 4 A Training Manual on Artificial Insemination in Goats (English & Sindhi)
- 5 Feeding Dairy Cattle and Buffaloes: Training Manual for Extension Workers in Pakistan (English, Urdu & Sindhi) (ILRI-AIP/SAGPL)
- 6 Feeding Tables for Ruminants in Pakistan - English (ILRI-AIP)
- 7 Compendium for Forages and Feed Resources for Ruminants in Pakistan (English) - ILRI-SAGPL
- 8 Training Facilitator Guide on Animal Health Management (English, Urdu, Sindhi) - ILRI-SAGPL
- 9 Training Facilitator Guide on Feeds and Feeding (English, Urdu, Sindhi) - ILRI-SAGPL
- 10 Training Facilitator Guide on Reproduction & Breeding (English, Urdu, Sindhi) - ILRI-SAGPL
- 11 Glossary of Technical terms used in Animal Science - English-Udu-Sindhi (ILRI-SAGPL)



Technical Reports

- 1 Rhodes and Rye Grass Performance under various Agro-ecologies of Pakistan: Livestock Value Chain Perspective (ILRI-AIP - Technical Bulletin:01/2016)
- 2 Willingness to pay (WTP for Aflatoxin-Free Milk in Pakistan: Islamabad, Faisalabad and Lahore (ILRI-AIP - Technical Bulletin:02/2016)
- 3 Report on Farmer Participatory Trial on Free Access to Drinking Water and Feeding Roughages on Milk Production conducted at MPG Bhaloo Bhatti in District Mirpurkhas (ILRI-SAGPL-Technical Report)



Training Materials

- 1 Feeding Chart - Cattle (English, Urdu % Sindhi) - ILRI-AIP & SAGPL)
- 2 Feeding Chart - Buffaloes (English, Urdu % Sindhi) - ILRI-AIP & SAGPL)
- 3 Cow Calendar (English, Urdu % Sindhi) - ILRI-SAGPL.



Posters 4x3

- 1 ILRI Thematic areas
- 2 Artificial Insemination in Goat
- 3 Capacity Building: Way Forward to Change Mindset
- 3 Conventional and improved fodder production systems in Chakwal, Punjab
- 4 Herbal anthelmintic paves the way for economic control of internal parasites
- 5 Overview of Livestock sector in Sindh: Finding of snapshot and Forage surveys
- 6 Hydroponic: For Water and Land Scarce Areas?
- 7 Importance of free access to water and feed
- 8 Improved feeding management during reproductive stages of small ruminants leads to higher productivity.
- 9 Rangelands of Balochistan: current status, threats, opportunities for enhancing livelihood in the context of climate change.
- 10 Snapshot of the Dairy Sector in Balochistan
- 11 Snapshot Survey: An approach to identify best bets for interventions.
- 12 Status of Green Fodder Availability for Livestock in AJ&K: Constraints Solutions and Way Forward.
- 13 Vaccination calendar for small and large ruminants in Punjab.
- 14 Volunteer Farmer Training Models: Solution for Dilemma
- 15 Control of Peste Des petits Ruminants (PPR) in Pakistan
- 16 Investigating the Impact of Quality Protein Maize Grains.
- 17 Maize Silage Quality Assessment in Punjab
- 18 Guide to use the “feed chart” for Milking Cattle & Buffalo
- 19 Milk-in (Treble purpose) plastic can for milking, checking mastitis and transport.
- 20 Monitoring and Evaluation and Learning Plan



Fact sheets

- 1 Digestion in the rumen
- 2 Management of calves
- 3 Management of heifers
- 4 Oestrus cycle and heat detection
- 5 The in-calf cow
- 6 Fresh cow problems
- 7 Management of dry cows
- 8 Dry cow therapy - Mastitis control
- 9 Body condition scoring of dairy animals (cattle & Buffaloes)
- 10 The process of milking
- 11 Clean milk production
- 12 Water for dairy animals
- 13 Taking girth measurements & estimating Live Weight
- 14 Roughages for dairy cattle & buffaloes

- 15 Impact of free access to water & balanced feed on milk production
- 16 Feeding concentrates to dairy cattle and buffaloes
- 17 Minerals and dairy animals
- 18 Urea- Molasses-Mineral Lick Blocks

- 19 Pasture production
- 20 Mott grass: Cultivation and Nutritive Value for Ruminants
- 21 Rye grass: Cultivation and Nutritive Value for Ruminants
- 22 Rhodes grass: Cultivation and Nutritive Value for Ruminants
- 22(a) Rhodes grass (Tolghar): Cultivation and Nutritive Value for Ruminants
- 23 Alfalfa (Lucerne): Cultivation and Nutritive Value for Ruminants
- 24 Berseem: Cultivation and Nutritive Value for Ruminants
- 25 Sorghum: Cultivation and Nutritive Value for Ruminants
- 26 Para grass: Cultivation and Nutritive Value for Ruminants
- 27 Kallar grass: Cultivation and Nutritive Value for Ruminants
- 28 Oats: Cultivation and Nutritive Value for Ruminants
- 29 Jantar (Sesbania): Cultivation and Nutritive Value for Ruminants
- 30 Shaftal: Cultivation and Nutritive Value for Ruminants
- 31 Couch Grass: Cultivation and Nutritive Value for Ruminants



Diseases

- 1 Deworming (English & Urdu)
- 2 Vaccination (English & Urdu)
- 3 Tetanus (English & Urdu)
- 4 Pneumonia (English & Urdu)
- 5 Parasitic Injection (English & Urdu)
- 6 Mastitis (English & Urdu)
- 7 Foot and Mouth Disease-FMD (English & Urdu)
- 8 Esophageal Choke (English & Urdu)
- 9 Diarrhea (English & Urdu)
- 10 Bloat (English & Urdu)



Software

1. Ration Formulation for Cattle and Buffaloes using Pakistan Feeds for Animal Nutritionist and Veterinary Officers (Excel software) - ILRI-AIP
2. Ration Formulation for Cattle and Buffaloes using common feeds available in Pakistan for Extension staff and progressive farmers (Android and Web-based applications) - ILRI-SAGPL
3. Milk price calculator for MPG Milk Technicians (Android based)
4. Herd Management software for Farms and Progressive Farmers (Android and Web-based applications) - ILRI-SAGPL

Q & A on Animal Reproduction & Breeding Training of MPG Members

- 1. What are the factors other than health and nutrition which affects animal productivity?**

Ans: Reproduction and genetic makeup of the animal.

- 2. What is the function of female reproductive tract?**

Ans: Produce ova, facilitate fertilization, foetus growth & its nutrition.

- 3. What are the common signs of heat in cow/ buffalo?**

Ans: bellowing, and sniffing others, mucous discharge, standing to be mounted

- 4. What are the types of breeding?**

Ans: Natural & Artificial Insemination

- 5. What is the ideal time for performing Artificial Insemination?**

Ans: 10-12 hours from the first sign of heat.

- 6. What is the Role of farmer in getting successful result in A.I?**

Ans:

- › Should be aware about the proper heat signs & appropriate time of insemination.
- › Should have knowledge about type of semen to be used for insemination by an experience technician.
- › Farmer should facilitate the A.I. technician in whole A.I. process.

- 7. Why do you select animal in your herd?**

Ans: for keeping healthy and more productive animals in the herd.

- 8. Why do cull animals in your herd?**

Ans: for more profitability by culling low productive animals.

- 9. What is the use of cow calendar can you demonstrate/explain this?**

- 10. What is the importance to keep the proper breeding records?**

Ans: To maintain proper records

ISBN: 978-969-7564-12-5

Citation: E. Kang'the, M.N.M. Ibrahim, S.A. Khan and J.Githinji, 2020.
Training Facilitator guide on Animal Reproduction and Breeding. pp. 45.