Breed Improvement and Fertility Management

Training Package for Dairy Extension Workers







Developed with Dairy Training Centre

Breed Improvement and Fertility Management

Part I Training manual Part II Training Guideline

Preface

SNV Ethiopia, through EDGET project (Enhancing Dairy Sector Growth in Ethiopia, 2013-2018), engages in the capacity building, extension services and innovative support to the Ethiopian dairy sector particularly working with smallholder dairy farmers. The aim of the project is to increase milk production and productivity in order to double the income of the smallholder dairy farmers. EDGET is operational in the regions Oromia, Amhara and SNNP, and working with 65,000 dairy farming households.

The project works closely together with livestock regional bureaus and their respective zonal, woreda and kebele staff in delivering extension and other supports. One area of collaboration is the development of practical training and coaching tools and materials for extension workers based on a need assessment.

SNV has engaged the Netherlands based Dairy Training Centre (DTC) for the development of the Training package for extension workers. The documents were more elaborated and validated with the utmost contribution of high level experts from regional Livestock and Fisheries resources Development Bureaus/Agencies and Research Centers from the three operational regions of EDGET.

Overall nine training packages were developed on Breed Improvement and Fertility Management; Dairy Cattle Feeding and Nutrition Management; Dairy Cattle Health Management; Dairy Farm Management; Dairy Housing and Manure Management; Farm Economics; Forage Production and Management; Hygienic and Quality Milk Production; Young Stock Management.

This training package is on Breed Improvement and Fertility Management.

SNV, also on behalf of the experts that contributed and DTC, would hope to see the materials widely used outside the project areas by all interested dairy development practitioners. The materials will be available in hard copies and soft copies including on SNV website www.snvworld.org and other relevant websites.

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Abbreviations

AI	Artificial Insemination
ATARC	Adami Tulu Agricultural Research Center
CI	Calving Interval
CL	Carpus Lutiem
EDGET	Enhancing Dairy Sector Growth in Ethiopia
FSH	Folicle Stimulating Hormone
LH	Luteinazinig Hormone
LN ₂	Liquid Nitrogen
Lts	Litres
MOA	Minstry of Agriculture
NEB	Negative Energy Balance

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I. Breed Improvement and Fertility Management Training Manual

1. Introduction

Dairy cattle production has increased recently due to the high demand for fresh milk for a growing population and demand for value-added milk products for an expanding urban middle class. To meet this increased demand, there is need to increase the amount of available milk. This increase can be either by increasing the milk yield per cow or by increasing the number of animals. Due to pressure on land, increasing the milk yield per cow is the preferred option.

Dairy farmers have taken up this challenge but are constrained by the lack of technical and non technical information on managing their animals. At times the available information is too complicated for them to understand. Increasing milk production is a combination of good genetics improvement and fertility management. To realize the full milk production potential of these genotypes, there is need for proper managerial practices, especially with regard to breed improvement and fertility management. Farmers need to be knowledgeable on how to maximize dairy production and productivity by improving their breeds and practicing fertility management.

Breed improvement and fertility management are the strategic option to improve the dairy herd. There are two methods of improving animal breed. One is natural selection to make better use of the existing genetic material by better feeding and management and the other one is to improve the genetic make up of the animal that means crossbreeding. These two methods should normally go hand in hand even if there are situations where more emphasis should be placed on one of the two. In many ways selection among indigenous stock would be the most reliable ways to improve the milk yield or any other trait but this is very slow method. Cross breeding is the fastest option in breed improvement. Dairy breeding improvement interventions, combining artificial insemination (AI) using exotic semen with estrus synchronization are the viable technologies applied in improving and/or increasing milk production and productivity of dairy cows.

With good breed improvement and fertility management,milk production reaches a peak from week 4 to week 10 after calving, then goes down gradually in the lactation period. The highest yield (average yield/day) can be reached when the cow has one calving per year (305 day in milk plus 60 days dry off period). The overall objective of breed improvement and fertility managements of livestock is to increase in efficiency of production or to improve the quality, quantity as well as profitability of farm animals. Additionally, effective genetic improvement and management systems limit genetic exchange among the populations, minimize inbreeding and preserve special characters of each population.

1

2. Breed improvement and fertility management

2.1 Breed improvement strategy

Cattle breed improvement strategy should aim at improving productivity per animal. Productivity can be increased by modifying the genetic make-up of cattle and their production environments while safeguarding the environment. Keeping a large number of unproductive cattle contribute to feed shortage, land degradation and environmental pollution.



Figure 1 An inseminator at work

Comprehensive and integrated within breed selection and/or crossbreeding programmes are strictly required to realize food security and preserve the genetic resources for the future generations. In parallel to breeds improvement strategies, there should be strong interventions concerning the conservation of rare and endangered breeds. Several breeds are reported extinct and many are on the verge of extinction (example Sheko breed) unless effective conservation strategies are in place.

Sustainable use, breed development and conservation of cattle genetic resources are vital to agriculture, food production, rural development and the environment. Therefore the importance of breed improvement strategy is help to addresses conservation and genetic improvement of the cattle that based on the diverse agro climatic conditions existing in the country to incease milk production and productivity.

Breeding can be achieved through natural service or artificial insemination, and irrespective of the method, the aim should be to achieve increased chances of conception.

Methods of breed improvement are:

- A. Selection (Breed type and body confirmation)
- B. Crossbreeding (using natural bull and AI services)

Selection

It is a process in which certain individuals in a population are preferred to others for the production of the next generation. Selection is practiced to increase the frequency of desirable genes in a population and to decrease the frequency of undesirable genes.

Crossbreeding

It is a process of upgrading of the animal using natural mating (uisng improved bull) and Artificial insemination (AI).

Natural mating: is where the cow is taken to a bull and left for some time for the bull to serve.

Advantages

- A bull is the best possible heat detector
- Fertility rates are mostly better
- The semen is fresh and of good quality since there is no handling problems.

Dis-advantages

- A bull can serve only one cow per time
- Risk of sexually transmitted reproductive diseases
- Risk of inbreeding if the bull is not changed frequently
- · Rearing a bull is not economical especially to a small holder farmer

Artificial insemination (AI): It is a technique by which semen is introduced artificially into the body of the uterus at the time of heat in an attempt to cause pregnancy (the insmented sperm is collected from the bull, processed, stored, and artificially introduced into the female reproductive tract). And it is globally accepted method of breeding cattle and is a fast and easy means of exploiting the genetic potential of proven male animals. Of all technologies that have been in use, AI is the one that has so far made the greatest impact on animal genetic improvement. In recognition of the low milk productivity of local cows, cross breeding, using artificial insemination allows to combine the superior performance of specialized dairy breeds with the superior adaptability of local stock.

	Advantages of AI		Disadvantages of AI
•	It provides the opportunity to select high quality bulls, It minimizes the risk of spreading sexually transmitted reproductive diseases, It reduces the costs and the risks of keeping bulls at the farm, The quality of the bull and the semen is checked, Frozen semen can inseminate thousands of cows per year, Frozen semen can be stored for years and can easily be transported genetic material, Increased rate of genetic gain	•	It can not overcome lowered fertility or sterility more than natural mating Careless use of AI may result in lowered fertility Due to lower awareness on heat detection the conception rate immediately following the use of AI in new area (locality) is frequently lower than the previous natural mating If not properly managed and carefully used:- The spread of reproductive disease, the spread of unwanted and deformed genes can occur



Bull
selectionSemen
quality
checksSemen
treatment
and
storageutilization

Figure 2 Procedure of semen collection and utilization

Semen collection will be done from

- Healthy bull with high fertility
- High genetic potentials

Semen quality checks

- Volume of semen V (ml)
- Motility (mass and individual)
- Concentration C (tr/ml)
- Rate of abnormal sperm cells
- Semen morphology
- Free from diseases causing agents



Figure 3 semen collection

Treatment and storage of semen

Proper semen handling is essential to maintain optimum reproductive performance. The semen had been diluted in an egg yolk/citrate extender, loaded into 0.25 ml - 0.5 ml artificial insemination straws at a concentration of 50 X 10^6 sperm per straw, frozen in liquid nitrogen (LN₂) vapor, and stored in LN₂ tanks at minus -196°_c until used.



Figure 4 semen storage and transporting equipment

Selection of semen

In order to improve genetics, the right semen has to be selected. This selection can be made on many characteristics the bull can give to the calves:

- Milk yield
- Milk composition, like fat percentage or protein percentage in milk
- Resistance against certain diseases
- Ease of calving
- Ease of milking
- Exterior characteristics like for instance legs and Etc.

The straw with the semen is thawed before the insemination.



Figure 5 Straw with the semen is thawed and the inseminator at work

AI Utilaztion

AI is done when a cow is in heat. The hardest task in AI is to determine the time for insemination. After insemination (natural service or AI), the cow will get pregnant if sperm goes to the right place at the right time. From 10-12 hours after heat time, eggs will be released and survive for about 6-12 hours. Meanwhile, sperm can survive in uterus for about 24 hours. Therefore, the rule of morning - afternoon should be followed.

Application of the morning-afternoon (a,m. - p.m) rule

If the cow is in heat in the morning, inseminate her in the afternoon If the cow is in heat in the afternoon, inseminate her in the next morning

Note

If a cow inseminated the day before is still in heat, inseminate her again. But for indigenous/local cows should always inseminate on the day of standing heat.



	0	6	12	18	24gio
Artificial Insemination	Too early	Good	Best	Good	Too Late
Natural Service	Too early				

Figure 6 Timing of insemination for natural and AI method

Timing of insemination/services

Timing of insemination is the exact time when the cow fist stands to be mounted. Optimal timing of insemination differs in local and exotic cows. The best conception rates for exotic and crossbred cows are obtained with insemination carried out 8-24 hours after the onset of heat. Local animals should always be inseminated on the day of standing heat. A cow on heat should give you a sign of standing to be mounted. She will stand firmly, no signs of hostility nor aggression nor escape from the mounting cow. Occasionally she will mount another cow head to head.

Table 1 Timing of insemination

Estrus observed	Timing of insemination		
Before 12 a.m.(6 Eth.time)	The same day, in the afternoon		
After 12 a.m. (6 Eth.time)	The next day, in the morning		

MOA, 1989

Note

- The best time to breed is 12 to 24 hours after the onset of standing heat.
- When cows are checked for heat 2 or 3 times daily, the onset of standing heat can usually be determined.
- Standing to be ridden is the only reliable sign of when to inseminate a cow.

2.2 Fertility management

Fertility has been defined as the desire and ability to mate, the capacity to conceive and nourish the embryo and finally the power to expel a normal calf and fetal membrane. Healthy cattle give expression to normal fertility by producing one viable calf per year. Fertility in dairy cattle is affected by environmental, genetic, disease and management factors. These influence the reproductive process at ovulation, fertilization or implantation or during gestation and parturition. The commonest estimate of fertility rate is the percentage of mated or inseminated cows that become pregnant (pregnancy rate) or finally calve (calving rate). However, fertility can also be expressed in other ways as follows: a general fertility rate, which is the ratio of calves born to females of breeding age, expressed as a percentage; and a specific fertility rate, which measures the number of births within a given group or the total fertility rates of females over their reproductive life. Net reproductive rate was given as the extent to which the female calves of one generation survive to reproduce themselves as they pass through calf-bearing age, expressed as the number of female calves that survive per 100 females of breeding age.

Fertility rates can also be estimated prior to calving as the percentage of non-return rate. This is the number of cows bred that do not come back in heat and are thus assumed to have conceived and get pregnant. Cows start to produce milk immediately after calving. When a cow does not get pregnant she will not produce milk. This means that fertility management should be in order.

Infertility indicates a degree of reduced fertility, which results in failure to produce or delay in producing the annual live calf. Infertility interfere with the move from one generation to the other. Infertility has effect on efficient production of milk since pregnancy and parturition are necessary for the initiation and maintenance of lactation in the species. It is adversely affects the production and productivity of local and crossbred cows and heifers in Ethiopia. Therefore, it is essential to use technological options and approaches to improve supply of desirable animal genetic material that incorporates estrus synchronization and AI can be tremendous.

Risk factors related to Infertility in dairy cows are: Inadequate nutrition, Poor Reproductive Management, Increased incidence of diseases and Poor cow welfare.

Economical importance of infertility are:

- Prolonging the calving interval, which results in less milk produced per cow and fewer calves born per year (Reduced production and reproduction)
- Increasing culling due to infertility and therefore, increased replacement costs.
- Increased labour, semen costs and veterinary bills i,e treatment and prevention costs
- Prolonged Period of uterine diseases
- Handling un productive cows with extra expense
- Loss of market opportunity
- Reduced salvage value
- Repeated breeding cost.
- Reduced herd longevity

Indicator	Unit	Goal	Limit
For individual cow			
Age at first calving	Month	< 24	> 30
Calving Interval	Month	< 12	> 14
Return to heat after calving (1st heat)	Day	< 40	> 60
No. of insemination per conception	Number	< 1.7	> 2.5
Days of dry period	Day	50 - 60	< 45 or > 70
Days between calving and conception	Day	< 85	> 140
For herd			
Average calving interval	Month	< 12	> 14
Heat after calving	Day	< 40	> 60
Insemination after calving	Day	< 45	> 60
Cows return to heat within 60 days after	%	90	< 90
calving			
No. of insemination per conception	Number	< 1,7	> 2,5
Rate of heifers get pregnant after 01 service	%	> 65	< 60
Rate of mature cows get pregnant after 01			
service	%	> 50	< 40
Rate of mature cows have to do 03 services	%	< 10	> 10
Days of dry period	Day	50 - 60	< 45 or > 70
Interval between calving and next pregnancy	Day	85 - 110	>140
Rate of cows with interval between calving			
and next pregnancy > 120 days	%	< 10	> 45

Table 2 Fertility management goal indicators

Indicators

For heifers: Age at the first calving

- Ideally < 24 months and limit not more than 30 months
- Heat detection and insemination should start from 12 months
- Heifers should be at least 350 kg when inseminated

For cows: Day between calving and insemination

- 1st insemination should take place within: Ideally before 45 days after calving and limit not later than 60 days after calving
- Day between calving and pregnant: Successful insemination should take place: Ideally before day 85 after calving and limit not later than 140 days after calving.

Dairy farmer and AI technician Role on Fertility Management

Farmers:

- Perform selection of good dairy animal for improvement
- Ensure good dairy farming practices.
- Observe heat in time and present cows/heifers seen in heat for insemination
- Keep healthy and productive animals
- Conserve feeds for period of shortage

- Feed the animals properly
- Present cows for PD
- Give calving reports
- Rear calves properly
- Keep close contact with AI technician
- Keep forward aspiration with genetic improvement of his herd

Inseminators:

- Should be skillful and proper AI service delivery
- Semen should be of high quality
- Ensure good storage of semen
- Programmed daily activity
- Perform proper recording as per the standard format
- Obey the standard service delivery rules and hygienic/sanitary conditions
- Accept or reject cows presented for insemination and tell to the farmer what to do next time
- Perform PD and advise farmer what to do
- Collect calving report If everything above is fulfilled, every 12 months a cow will have one calf.
- Out comes of having good breed improvement and fertility managem
- Efficiency of fertility for well managed dairy cow

Note

The signs of heat are easy to see when

- The cow is healthy and free from reproductive diseases
- The cow is not injured
- The cow does not suffer from stress (incl. heat stress)
- Feeding is sufficient and balanced
- The cow doesn't have a difficult calving
- The cow can roam freely

Handling of fertility problems

Understanding of fertility problems requires skills, knowledge and thoroughness of diagnostic procedures. The knowledge of contributing causes help to interfere the cause on time and to bring optimal fertility.

Optimum fertility occurs when a cow:

- Recommences cycling soon after caving (within 42-45 days).
- Conceives within 85 days (max. 100).
- Produces a viable zygote, which implants in the uterus and
- Survives to full term to produce a healthy calf which survives to adult-hood to continue the reproductive cycle to continue a second generation.

The best measure of animal fertility is its ability to produce a second-generation progeny. This can be achieved by maintaining full stages of reproductive cycle to obtain one calf per year per cow. Howevere, fertility efficiency dependent on:

- Obtaining normal uterine involution.
- Early resumption of ovulation.
- High efficiency of estrus detection.
- High conception rates per service.

Thus, when we have good fertility management

- 65 to 70 percent of the cows conceive on first service.
- Average of 1.3 to 1.7 services per conception.
- Less than 10 percent of the cow with reproductive "problems"
- Calving interval between 12 to 13 months.

2.3 Outcomes of good breeding and fertility management plan

Improving Milk yield

Milk yields of dairy cows improved by improving the over all management of dairy cows that means feeding, housing, health care and keeping all hygeinic precautions etc. Therefore, integrating the knowledge available on the application of principles of breed improvement, nutrition and feeding, housing, health care and handlings are paramount important to improve the milk yeild in the dairy sector.





Calving interval (CI) is the period between calvings. The most productive interval is one year. In order to reach this optimal period the cow should become pregnant with in three months after calving. It is calculated as the interval between two successive calvings. It is an indicator of a cow's reproductive performance. The longer the calving interval is, the lower the average dairy milk production will be. The longer the dry period is, the longer you have to feed a cow that does not produce milk that bring the income loss which is not economical to the farmer. Therefore, to shortening the calving Interval means the cow should come in heat within 40 days after calving so that the farmer should:

- Give good management care that means feeding, housing and health care to the cows and assure that the cow is in good condition.
- Close follow up and pay attention to heat detection.
- Consult AI technician in time.
- The animal should be inseminated and/or served within 60 to 80 days after calving.
- Keep clear records
- Pregencay test should be done after 2-3 month of insemination or servce.

Lactation Length refers to the period of time between calving and drying off. Breed, level of nutrition, parity, suckling, and other management factors affect lactation length. Indigenous zebu breeds were found to have shorter lactation length compared to crossbred

dairy cows. Dairy cows on good feeding regime will have longer days in milk compared to those kept under poor feeding regime. Therefore attempts to increase milk yield through cross breeding, selection, better feeding and improved management will also extend lactation length.

Exersize 1

Define laction length and how to improve laction length due to breed improvement and fertility management ?

For example: Miss Alemitu is a dairy farmer having two dairy cows having short and long laction length.

Cow 1: Has 4 lactations in 4 years (1 calving per year)

Lactation 1: 4,000 lts/lactation Lactation 2: 4,200 lts/lactation Lactation 3: 4,100 lts/lactation Lactation 4: 4,000 lts/lactation

Total in 4 years: 16.300 lts milk production (lts/day in 4 years) = $16,300 / (4 \times 365) = 11.16 \text{ lts/day}$



Figure 8 Lactation length of cow 1

Cow 2: Has 3 lactations in 4 years

Lactation 1: 4,200 lts/lactation

Lactation 2: 4,300 lts/lactation

Lactation 3: 5,000 lts/lactation

Total in 4 years: 13,500 kg milk production (lts/day in 4 years) = 13,500 / (4 x 365) = 9.25 lts/day



4 years



Average milk production/day of cow 1 is higher than of cow 2 with nearly 3,000 liters or 1.9 lts of milk per day.

3. Heat Signs and Detection, timing of insmenation

3.1 Heat Sign

Heat is a period of intense sexual excitement by a cow and heifer. It occurs only in nonpregnant heifers and cows (not included parturated cow and heifer till 40 days). The period of receptivity lasts between 6 to 30 hours. The average interval between 2 heats is 21 days, but it can vary from 18 to 24 days.

In non-pregnant cows, the ovaries are producing the eggs and sexual hormones. Every 21 days, a mature egg is released from ovaries. Just before releasing the egg, hormones are released that cause the heat signs. A hormone is a substance produced by an organ in the body and released in the blood stream that gives signals to modify certain organs to increase or decrease a certain activity.

Origin	Hormone	Effects in Female	Effects in Male
Pituitary	FSH	Stimulate the growth of Follicles	Stimulate sperm production
	LH	Cause Ovulation, stimulates CL formation	Stimulates testosterone production
Ovary	Estrogen	Causes estrous sign, increase blood flow to the uterus	
	Progesterone	Prevents estrus and ovulation, maintains pregnancy	
	Prostaglandin	Breaks down the CL, causes uterine contractions	
Testicle	Testosterone		Affect libido and sexual characteristics, stimulates sperm production, affects function of accessory sex organs

Table 3 Reproductive hormones their origin and effect

Source: MOA, 1989

Hormonal regulation of the sex organs takes place in the brain. Here the pituitary gland releases two hormones FSH (follicle stimulating Hormones) and LH (luteinizing hormone). The ovary releases estrogen, progesterone and prostaglandin hormones.

3.1.1 Sign of early heat

The early heat lasting 6 to 10 hours.

Signs of early heat (see the picture belw)

- Sniffs other animals and being sniffed by other animals
- Mounts other animals but walks away when mounted
- Looks restless around, fuzzing
- Bellowing
- Vulva is slightly swollen
- Reduced feed intake
- Licking other cows is the sign of ealy heat



Figure 10 Sniffs, mounting and swollen Vulva

Note that:

Heat should be checked three to four times a day. Numerous studies indicate poor oestrus (heat) detection is the most common cause of prolonged inter-calving intervals in dairy cattle so herd managers must insure that animal attendants responsible for this are competent.

3.1.2 Standing heat

The standing heat lasting 12 - 18 hours

- Sniffs other animals and being sniffed by other animals. Especially sniffing vulvas or urine of other cows
- Mounts other animals and stands when mounted
- Bawls frequently
- nervous and restless
- Vulva is swollen and deep red
- Flow of clear mucus from the vulva



Figure 11 Mounts other animals

- The animal may stop or refused to eat and social contact with other cows
- Sharp decline in milk production



Figure 12 Swollen Vulva, deep red and flow of clear mucus from the vulva

- Behaves otherwise and fight other cows
- Turns in circle or presses her chin on the back of other cows
- Frequently urinate
- Tail bent away from vulva



Figure 13 The cow during insemination

3.1.3 After heat

It is a period lasting approximately 24 hours.

After heat signs:

- bawl
- Vulva is slightly swollen
- Dried mucus on the tail
- Roughened tail head
- Streaks of saliva or signs of leaking on her flanks
- Still sniffs other animals and being sniffed
- Refuses to stand when mounted
- Clear mucus from vulva

The early heat	The standing heat	The after heat	
Duration 3 – 8 hours	Duration 6 – 18 hours	Duration 3 – 12 hours	
- Nervous, restless - Stands alone - Mowing - Sniffing	 Mounting other animals Refused to eat Mowing Sniffing 	 Mounting other animals Symptoms of cool down Less sniffing 	
 Curious Mounting other animals Does not stand when mounted 	 Tail bent away from vulva Stands still when mounted by other animals 	- Runs away when mounted	
- Vulva is slightly swollen	- Vulva is swollen - Flow of clear mucus from the vulva	 Some bleeding from the vulva Less flow or clear mucus from the vulva 	
- Sometimes decline in milk production	- Often decline in milk production		

Table 4 Summary of heat detection in dairy cow/herd

3.2 Heat detection

It is a process of identifying cows and heifers to the stage of heat sign to receive bull or insemination. Heat detection is essential if artificial insemination (AI) is to be carried out. Spotting a cow standing to be mounted is the crucial sign to look out for as it is the most useful indicator to use to decide when to serve a cow.

- Good heat detection starts with good routine!
- Set regular moments to look for heat.
- Do it once in the early morning, once at mid day and once in the evening.
- It will be very productive and efficient time, when you are able to recognize all cattle in heat.
- You can never earn more in such a short time

Look at:

- Changes in the vulva
- Changes in behavior
- Always keep a record when symptoms are observed

Note

- When you have not inseminated the cow she will bleed after a few days. If you have inseminated the cow, but it was not successful, the cow can bleed as well.
- The bleeding sometimes goes unnoticed, because you can't see the blood.
- Most of the time the cow is not pregnant when she bleeds but there are exemptions where the cow can be pregnant even when she bleeds.
- When you see the bleeding, note it down, so you know that in three weeks time you need to watch her carefully.

Possible reasons for no heat

i. No ovulation and no heat: this due to;

- Reproductive disease
- The cow has recently calved and the reproductive cycle has not started again.
- Hormonal imbalance
- Poor nutrition
- Heat stress
- The cow is pregnant

ii. Silent heat

There is ovulation, but the cow does not show heat signs (silent heat). This can occur in the first cycle after calving. Silent heat is the heat that will not be detected. When you see a cow for the first time in heat but is already 60 days after calving, you know that you have missed the first heat. Similarly when you see a cow in heat 6 weeks after the first heat, then you likely have missed the second heat.

It is a signal of bad heat detection when this happens regularly at your farm. Of course when a cow is pregnant she will not show heat either. Keep this option always in mind and when doubting, check your records or call a veterinarian.

When you inseminate your cow and you don't see her in heat the month after, it could be because the cow is pregnant or because the cow didn't show heat. This is why it is very important to watch the inseminated cow carefully every 3 weeks after insemination. So after 3 weeks, 6 weeks, 9 weeks, etc.

It is possible that the cow does not show heat due to other systemic diseases, poor body condition and breed types (Boran breed).

Insufficient heat detection Very short heat period (<6 hours), possibly in the night. The farmer did see it, but did not record and forgot about it. In practice these are the most common reasons why heat is not detected. Heat detection is one of the most important skills a dairy farmer should have and its importance cannot be emphasized enough. So if heat is not detected on a farm, first look at the person (the fertility management), then look at the cow. This is often very difficult. Ask the farmer questions about when he observes cattle, for how long, how often, where, at what signs he is looking, how he notes it down, are there other people at the farm, who look at it, etc.



Figure 14 Body condition score

Synchronization of estrus is the act of making a number of cows came in to heat at the same time. This allows better planning of breeding activities and wider use of A.I. This technology has been used in smallholder systems in many countries with variable results. In order to ensure success it is important that animals selected for treatment are healthy, in good condition and cycling and are not stressed or handled roughly during treatment and A.I.

Example: a farmer can use synchronization technology if the cow and heifer are not show heat during normal cycle and/or the animal have long CL the farmer can use this opportunity as a bussines man.

Estrus synchronization is a good management tool that can help dairy producers to improve reproductive efficiency and economic returns.

- Shorten the breeding and calving seasons
- Leading to programmed feeding
- Easier management of the cows being at the same stage of gestation.
- Easy and convenient calving due to expected date of calving spread over a shortest possible period.
- Produce large number and uniform animals of desired germplasm
- Calving with feed availability and market demand for dairy
- · Control heat period and allow more accurate AI service
- Improve the effectiveness and efficiency of AI service.

Heat Calendar

It is a simple tool and can prepare a three week to see easily when a cow expects the next heat calendar (Table 5). This three week calendar is a simple tool to improve your fertility management. Other systems you can use are a fertility health chart or a cow calendar. Fertility health is attached to this module in a excel file.

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

Table 5 Three weeks heat calendar

How to prepare three-week Heat Calendar?

You make columns with 21 rows next to each other. You start with writing down the first day on your calendar and you continue to write down the first 21 days on the calendar, then you go to the top of the next column and continue writing down again. When you see a cow in heat, you write down her name or number in the cell with the date you saw the

cow in heat. For example, on day 9 of the month. Then three weeks later on day 30 you look to the left column and you see which cattle were in heat three weeks ago, so you can give extra attention to these cattle when observing them.

4. Reproduction and fertility management

4.1 Feed and Feeding

Nutrition is the single most important factor that affects cow fertility. For example low energy intake causes delayed puberty, silent heat and infertile ovary. Vitamin A and D are heavily involved in reproduction and their deficiency affects conception and pregnancy. Overfeeding results in fatty ovaries, low hormonal secretion hence low conception rate.

Many studies show the influence of nutrition on cattle fertility. Differences in nutrition probably account for most variation in reproductive performance between herds among animals and within herds.

The effects of underfeeding are greatest on pre-pubertal animals and lactating cows. Weight loss postpartum, due to underfeeding or high lactation demands, extends the postpartum anoestrous period. Underfeeding also reduces milk yield, which reduces the growth of the calf. This reduces calf weaning weight and delays puberty, which reduces the potential lifetime productivity of the female calf (refer dairy feed and nutrition management manual).

Feeding in relation to fertility is very important that your cow is in a good condition, when she calves. This is because:

- She will come in heat more easily
- She will have a good milk production
- She will not lose as much weight during the first two months of lactation
- Make sure that during the period that the cow gives milk you provide her:
- With water 24/7 (free access)
- Energy e.g. grains, molasses and maize
- Protein e.g. dairy meal legumes, oilseed, cakes, brewers grain
- Minerals or salts e.g. Mineral nutrient blocks
- Vitamins e.g. fresh fodder/green feeds

To do regularly a body condition score as you have learned in the module dairy nutrition will give you insight in the condition of your cattle and is a good tool to judge your ration.

Note:

When you want to inseminate your heifer you see the heifer is too fat (body score above 3.5). Make sure that:

- Give her a complete fodder with limited energy, enough minerals and enough protein
- Give them a lot of exercise (for example let them walk to a place to eat and put the water through somewhere else)
- Let a good inseminator inseminate your heifer or choose for natural service
- Do not let heifer go down in body condition score too quick, she will get a negative energy balance
- Prevention; feed your heifers enough protein besides energy.

In dairy cows, an abrupt increase in milk production after calving imposes high metabolic 19

and thus nutritional requirements on the cow. When dry matter intake does not meet increased energy requirements, a status of negative energy balance (NEB) develops.

Ketosis, or acetonaemia, is a metabolic disorder in cattle associated with an inadequate supply of the nutrients necessary for the normal carbohydrate and fat metabolism that is seen mainly in times of high milk production in early lactation. During early lactation, the energy intake is insufficient to meet the energy output in milk and the animal is in a negative energy balance.

Metabolic profile	Metabolic and high level functional changes	Endocrine changes	Functional changes
Negative Energy	Impaired synthesis and secretion GnRH and LH	Anoestrus	Poor estrus demonstration
Balance		Poor follicular growth and estrogenic capacity	Poor quality of oocyte
		Delayed LH peak and ovulation	Increased early embryonic mortality
Emergency energy production from adipose tissue and proteins	Increased levels of triacylglycerol in circulation (impaired liver function)	Impaired immune function of endometrium and increased susceptibility to uterine infections	Emergency energy production from adipose tissue and proteins
	Increased levels of urea in circulation	Uterine environment less favorable for the embryo	
Increased Metabolic Rates	Increased metabolism of oestradiol and progesterone in the liver	Decreased levels of oestradiol in general circulation	Poor estrus demonstration
		Decreased level of progesterone in general circulation	Delayed LH peak and ovulation
			Early Embryonic Mortality

Source:NAIC,2015

The detrimental effect of high ambient temperatures on reproductive processes in dairy cattle has been well documented and includes:

- Negative effect on reproductive pattern
- Impaired endocrine interactions and changed follicular development pattern
- Decreased quality of sperm, oocytes and embryos
- Negative effect on the nutritional status and energy balance
- At many farms in Ethiopia:
- Cows often suffer from heat stress
- Feeding for dairy cows is not balanced in nutrition
- Cows are low in body condition
- Cows are restricted within barns 24/24hours. For these cows it can be difficult to show heat and get pregnant.

Raising cows with more than 90% HF blood (HF, F4, F5...) is difficult in most regions of Ethiopia. These cows suffer more from heat stress than F1 (50% HF) and F2 (75% HF). In hot and humid condition, HF cows will show less heat signs. This might result in long calving interval.



Source: NAIC, 2015

4.2 Housing

Dairy cattle will be more efficient in terms of production and reproduction if they are protected from extreme heat, and particularly from direct sunshine. Thus, it is essential to provide good housing and farm layouts for rearing and milking dairy stock to reduce the extreme effects of air temperature and humidity. Such control improves milk production by reducing stress and disease hazards and also making herd management easier to improve breeds and fertility management (*see the detailed information from dairy housing and manure management training manual*).

Health and survival of the new born calf depend on its care and environment. Housing facilities range from complete barn enclosures to minimum shelters. A wide range of acceptable housing facilities exists. Calf housing should provide an environment that is clean and dry that will minimize stress. Protection from heat, cold, wind, and rain is important. Adequate space, animal comfort, and proper ventilation are necessary in designing a facility. Facilities should be accessible for thorough cleaning and disinfecting on a regular basis to reduce the number of pathogens.

4.3 Health

Reproductive diseases of dairy animals associated to reproduction disorders. In order to profitably operate a dairy farm it is important to know about the diseases and how to control and treat them.

- Reproductive diseases are diseases that interfere with the reproductive function of male and female animals.
- This interference is expressed in the form of reduced or total absence of fertility.
- It can affect individual animal or the herd, the entire population.
- In male animals, this reproductive disturbance can affect the sexual behavior and the ability to impregnate.

The cause of reproductive diseases are,

- Nutritional mismanagement
- Management in general
- Genetical factors and
- Infectious diseases

Economic significance of reproductive diseases are:-

- Loss of calves due to abortion,
- · Reduced milk yield by affected cows,
- · Loss of production due to prolonged calving interval,
- Repeat breeders affected cows do not easily become pregnant.

Set up reproductive health program: An important point here is solving fertility problems. Once the fertility problem is resolved, it is paramount to establish a goal of one calf per year per cow.This program requires adequate fertility management

- Check for reproductive diseases such as uterine involution
- · Check for cyclicity,
- Check for vaccination program and Scheduled treatment

Refer dairy cattle health management manual for the detail information about the economic significance of reproductive diseases on breed improvement and fertility management.

4.4 Breed type

Dairy cattle breed may be defined as a particular group of animals developed in a certain area for a definite purpose and having the same general characteristics such as colour, conformation and quality of product.

The breed type of dairy animals existing in Ethiopia are indigenous cattle breed such as Boran, Begait, Arsi, Horo, Fogera, etc. and the exotic breeds are Holstein Friesians and Jerseys breeds and their crosses with indigenous breeds that are bred primarily for milk production.

In an effort to improve the production and productivity of dairy animal different activities such as cross breeding and natural selection are being undertaken in the country. With this effort, quite a large number of indigenous cattle breeds have been crossed with exotic breed and encouraging improvement in milk and meat yield have been recorded. It is

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about half a century since genetic improvement activities on local cattle started. However, the genetic gain is insignificant and the number of improved breed is below two percent. The main reason for this insignificant genetic gain is obviously lack of synergy between breed improvement strategies, fertility management and dairy management strategies.

5. Record keeping

Record keeping is an important activity in any dairy enterprises. Farmers should therefore ensure that all farm activities are recorded promptly. Records are important to farmers because they can help farmers in many ways such as in making:-

- Management decisions
- Financial accounting
- Identifying problems
- Planning for the future
- Determining whether targets are met

Good record keeping is a prerequisite to an organized breeding and prevention of the deleterious effects of inbreeding. Lack of record keeping & reporting by AI service providers and farmers has adversely affected data analysis and decision making process.



Figure 16 Record keeping

Lack of AI records is highly believed to have increased the incidence of inbreeding in the country. So performance recording is a pre-requisite to effective decision making on breeding program and fertility management. One of the tools to manage the fertility of the herd is by keeping a record system.

Note

Under farm condition record keeping helps the farmer:

- To get critical reproductive data (heat, breeding service, and calving)
- Information about full history of individual animals
- To manage the animals as well as the farm
- To improve his income
- To improve his enterprise

There are different record keeping in dairy farm such as feeding, health, milking, and breeding. This can be done in many ways, from very simple to comprehensive. In case of large scale farms use advanced software programs, this help the dairy farmer to improve his/her profit by keeping proper farm data record using cow card (i.e. a card having history of individual animal in the farm) and it is an important tool. On this card you note down:

- Animal ID (ear tag number)
- Age
- Birth and current weight
- Calving date

- First heat
- All following heats
- The first insemination and the next ones
- Mark your control moments (pregnancy check, when in heat again)
- Special attentions (drop in milk production, lameness, mastitis, etc.)
- Look every day on each cow card
- Detect your control moments from the cow

Good records, like road map, are necessary to tell where you are going in your business. It helps to provide adequate information for breeding and genetic improvement of the stock. The kinds of records kept in a farm vary depending on the scope and nature of the enterprise.

5.1 Breeding Records

- Measure the productive efficiency of the herd,
- Enable culling and selection
- Breeding records include: Pedigree/parentage (Dam name, grand dam, sire name, grand sire), breed, birth date, heat dates, earliest breeding date, fertility (age at first calving, date of calving, number of services per Conception), Pregnancy examination, Expected calving date ,Drying off date, etc.

Owner's na	me:						
Region:	Region:						
Woreda:	Woreda:						
Kebele:	Kebele:						
Dam ID	Dam Breed	Dam birth date	Sire ID	Sire breed	Date of mating	Due date	Remark

Table 7 Breeding record format

Table 8 Performance record format

Owne	r's name	e:													
Regio	n:														
Wored	Woreda:														
Kebel	e:														
Pre - weaning							At weaning							Remark	
Calf ID	Birth date	Sex	Dam ID	Dam breed	Sire ID	Sire Breed	Birth Wt. Kg	Weaning date	Weaning wt. Kg	Type of rearing	Weaning group	Weight at marketing	Body condition score (1 - 5)	Calf price (Birr)	

5.2 Production Performance Records

Maintains the information associated with the performance of the cattle and the production of the land

- Milk production
- Meat production

5.3 Health Records

Health records provide overall health information about the animals in the herd. With the use of records, veterinarians can gain additional information about the probable causes of ill health in an animal: Vaccination, Dipping spraying, Treatment, De- worming and Postmortem.

Table 9 Health recoard format

Ow	ners Nam	e:								
Reg	Region:									
Wei	reda:									
Keb	ele:									
No		Data	Major	Suspected	Treatment G	iven	Deenenee	Damarda		
NO	ID/Maine	Date	signs	disease	Medication	Duration	Dosage	Response	кетагк	

5.4 Feeding Records

The amount of feed given as well as the type of feed. Feeding records should be used for day-to-day management, evaluating pasture management practices and for planning of activities in the future.

- Available fodder on farm
- Quantity fed
- Concentrate supplemented
- Minerals
- Left-over (per head and per feed. if possible) and Spoilage (per batch)

Table 10 Feed recod format Consumption /day/kg

Owner	s Name						
Regior	Region						
Wered	а						
Kebele	9						
No.	Date	Type of feed	Consumption/kg/	Cost /kg	Total cost	Remarks	

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Annex

Annex 1: Technical formulae in measuring reproductive efficiencies & rates

A) Reproductive performance parameters

Non return rates = <u>Cows r</u> Total fi	not returned for second insemination x 100 irst inseminated cows	
Total fertility of the herd=	Pregnant cows in the herd x 100 Total breed able females in the herd	
Conception rate at 1 st servic (pregnancy/Fertility rates)	re = <u>Number of pregnant cows x100</u> 1 st inseminations/ Total cows inseminated	
Overall Conception rate = <u>Number of pregnant cows x100</u> Total inseminations		
Service per conception=	Total insemination Cows conceived	
Calving rates= <u>Total c</u> Total ii	ows conceived and calved x 100	

B) AI technician's efficiencies in PD performance

Accuracy of negative PD=	<u>Numb</u>	er which have not calved x 100
	Femal	es diagnosed negative
Accuracy of positive diagno	sis =	Number of cows calved x 100

Cows diagnosed positive

II. Breed Improvement and Fertility Management

Training Guideline for Dairy Extension Workers



II. Breed Improvement and Fertility Management Training Guideline

A. Module Book

Introduction

The module Breed Improvement and Fertility Management is part of the working package "Business Management" introduced by SNV Ethiopia as part of the EDGET project. After extensive discussions with EDGET regional managers as well as with the government and SNV extension workers during the training of trainers program implemented in November 2016 it was decided to split up this working package into 2 different modules each having its own clear objectives.

One of the EDGET project objectives is to make small holders dairy farms more aware about "commercial farming". To become a "commercial farmer" it is crucial that cattle give regularly birth to a calf to start milk production and to maintain the size of the herd.

The module Breed Improvement and Fertility Management will help the dairy extension workers to acquire the knowledge, tools and skills to support farmers to improve the breed and fertility of their cattle by recognizing heat, to prepare an on farm fertility data record keeping system, discussing matters concerning about breed, how to improve through artificial insemination and suggesting management measures to the farmer to improve fertility of their cattle and to improve genetics. Next to this, the subject of fertility is closely related with subjects like breeding, animal health and nutrition. This gives participants of the course a good possibility to rehearse and the practice the skills obtained in earlier modules.

Professional situation

As an extension worker you usually have to advise small holder farms on how to manage their crops and livestock in the most optimal way. As an extension worker you should be able to clearly identify which kind of different "enterprises" a small holder farm has on his/ her farm and how they interact with each other.

A small holder farmer in Ethiopia has to manage these different enterprises on a farm. This also means that the farmer has to determine the objectives of these enterprises which usually focus on having enough food to secure for the family in sustainable manner and to generate income.

Small holder farmers usually have traditional knowledge and skills to manage their cattle. Milk is valuable commodity and dairy becomes more and more important to generate cash on a regular base. To specialize in dairy requires specific tools. The genetics of cattle will change and ability to produce milk will become valuable. This influences the physiology of the animal and managing breeding, feeding, animal health but certainly fertility requires additional skills. Techniques like artificial insemination become a tool to improve the ability of cattle to produce more milk. Also to have some kind of record system to manage breeding and fertility and to give information on the fertility status of the herd in order to support the farmer in management of the farm and to help extension workers and veterinarians to make their service more valuable.

As an extension worker you have the knowledge, skills and innovations to manage each of these enterprises in the most optimal way and you have the motivation and "drive" to convince small holder farmers to improve on their knowledge and skills in order to improve the technical and economic performance of each of their enterprises.

As an extension worker you are able to support the farmer in improving this performance also with regards to fertility. You know the basics of breed improvement and fertility management and you are able to recognize heat and able to transfer this knowledge to a farmer. You are able to assess the fertility status on a farm and you are able to make recommendations to improve this. Therefore you have the knowledge to develop together with the farmer a record keeping system and to help the farmer with preparing rations to keep the cow in good health and in condition.

As an extension worker you are also able to explain the financial benefits of changes in fertility management a small holder farms could introduce on their farms. You are able to discuss with a farmer benefits and disadvantages of these changes and help to let the farmer make the right decisions for the dairy herd. You will be able to explain small holder farmers what it means to become a commercial farmer. But you (and the owner) have other responsibilities as well; how to deal with environmental and social issues. In the end any business is only really sustainable if it is taking into account the three Ps; People, Planet & Profit.

Required entry qualification

To take part in this module on management you should comply with the following entry requirements:

- Competent in the English language
- Competent in observing cattle
- Have basic insight/experience in managing small holder farms and the enterprises present on those farms

Specific objectives and related topics:

At the end of the course participants are able to report and present breed improvement methods and fertility assessment to a farmer including recommendations how to improve fertility management on the farm. Therefore you are able:

- To explain the overall objectives and aim of breed improvement and fertility managements of livestock
- To identify breeding method and the strategic option to improve the dairy herd
- To explain the importance of breed improvement and good fertility management to a farmer and to explain the economical benefits of it
- To know the signs of heat , detection, and timing of insemination and to transfer this knowledge to the farmer
- To explain fertility management and identify fertility management goal indicators
- To help the farmer to make a tailor-made fertility record system
- To know the basic principles of artificial insemination and to discuss with a farmer the advantages and disadvantages of it
- To know semen collection, quality checks, selection of appropriate semen, treatment and storage, application of Artificial Insemination and Service a cow
- To know factors affecting breeding improvement strategy and fertility management
- To help the farmer to make a fertility management plan with regards to related topics as:
- Nutrition
- Animal health

Assessment

During the course one assessment will be conducted to measure the competence level of the participants to advise a small holder farm on fertility management. The assessment will be a group assignment. The group (maximum 4 persons) will have to visit an assigned small holder farm and implement the following tasks:

- · Ask the farmer the breeding method he/she can use his/her dairy cows
- Ask the farmer how many times he/she can attend his/her farm to check heat daily
- Observe over all activity of the farm
- Heat observation
- Assessment of the fertility status of the herd by
 - Interviewing the farmer
 - Doing a body condition score
 - Observing the rumen fill
 - Judging of the leg condition
 - Judging the ration of the cattle
- Look for a fertility record keeping system and assess it
- Ask the farmer specifically how he manage the fertility status of the herd
- A report will be made on paper or in a PowerPoint presentation and results will be discussed with all participants and in presence of the farmers by:
- Giving an overview of the observations and findings at the farm concerning breed improvement and fertility management
- Give clues about the importance of breed improvement to milk production
- Mentioning five positive points on the farmers fertility management
- Mentioning at least five points which can be changed to improve the fertility status of the herd
- Suggest a way how to record fertility data

Activities

Below an overview of all activities related to this module are presented:

Day	Time	Subject
1	1 st	Introduction Module/ participants/ trainer and introduction breed improvement and fertility management course
	2 nd	Workshop importance of breed improvement and fertility management
	3 rd	Presentation heat signals and fertility management
	4 th	Workshop and presentation on AI
	5 th	Farm visit to exercise skills learned earlier plus homework for next day
2	1 st	Discussing homework
	2 nd	Workshop and presentation fertility data record keeping
	3 rd	Workshop and presentation fertility management and factors affecting breed improvement and fertility
	4 th	Introduction to the assessment, formation of groups and preparing for interviews with assigned farmers
	5 th	Fertility management assessment of a farm
3	1 st	Prepare for presentation
	2 nd	Presentation in presence of farmers
	3 rd	Brainstorm on farmer training
	4 th	Course Evaluation and closing

Notes:

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•••••	•••••		• • • • • • • •	• • • • • • • •	•••••	• • • • • • •	• • • • • • •	•••••			•••••	• • • • • • •	• • • • • • •		• • • • • • •			•••••	•••••

B. Lesson matrices

Lesson Matrix	
Topic / Serial #	
Practical Lesson	Lesson 1
Date	
Venue	
Duration	1 day/ Day 1 of the Course
Type of students	Extension Workers
Suggested number of students	16
Starting situation	Students have very little or no experience with breed improvement and Fertility Management
Learning Objectives:	The student:
Skills	 Can explain the importance of breed improvement and fertility management Can explain the economical impact of fertility management Is able to recognize the signs of heat detection and timing of insemination Can explain the importance of genetic improvement to improve milk production Can describe the signs of heat to a farmer Assess the fertility status of the dairy herd Can explain the principles of AI and its advantages and disadvantages to a farmer Can explain at which moment a cow has to be inseminated and why
Knowledge	 The participant of the course will learn to see when a cow is fertile and will recognize the signs of heat related to the cows behavior and according to the swelling of the vulva. The participant will get knowledge about fertility management and artificial insemination and how it should be practiced.
Attitude	 To become enthusiastic in explaining the farmer the benefits of breed improvement and fertility management. Willing to learn the farmer to recognize the signs of heat. To advice the farmers about how to inseminate a cow in order to optimize his or her breed improvement and fertility management.

Time in minutes	Brief Content	Role trainer / didactical methods	Teaching aids	Role/activities Participants
30	Opening of the course, getting acquainted with each other, explanation of Module Book and course objectives	Explaining/ guiding/ making trainees feel at ease	Module Book	Listening, introduction of themselves, asking questions, answering questions
45	Workshop on importance of breed improvement and fertility management	Discussion leader Sharing experiences	White or blackboard	Discussing and presentation
45	Presentation on heat signals , detection and timing of insemination and the importance of fertility management	Presenting with help of a PowerPoint presentation	Breed improvement and Fertility Management Manual • PowerPoint heat signals,	Listening Q & A
30	Break			
45	Workshop AI	Discussion leader Sharing experiences	White or blackboard	Discussing and presentation
30	Presentation AI	Presenting with help of a PowerPoint presentation	Breed improvement and Fertility Management Manual • PowerPoint AI	Listening Q & A
15	Presenting afternoon program	Explanation program and task	Not applicable	Listening and questioning
60	Lunch			
80	Visit of dairy farm and: Observe heat signals for 30 minutes Assess the fertility status of the herd by looking at the body condition score and judging the ration Interview the farmer on how the fertility on the farm is managed (When possible split in two or three groups or visit two farms)	Travel to farm Explain checklists Demonstrate skills Help and guide participants	Small holder farm	Visit small holder farm/ practice skills/ fill in checklists
30	-Summary/ reflection/ homework	Summary theory/ testing knowledge Study chapter 2 and 3 manual	Manual • Assignments • Homework	Answering and asking questions

Lesson Matrix					
Topic / Serial #					
Practical Lesson	Day 2 Breed improvement and Fertility Management				
Date					
Venue					
Duration	1 day/ day 2 of the Course				
Type of students	Dairy Extension Workers				
Suggested number of students	16				
Starting situation	Students have very little or no experience with breed improvement and Fertility Management. At the first day of the course breed improvement methods, basic heat signals and AI were discussed and taught.				
Outcomes	The student is able to:				
Skills	 Practical skills which are taught at the first lesson Being able to interpret the parameters which give information about the fertility status of the herd Being able to identify fertility goal indicators Being able to judge the fertility status on a farm Able to make fertility record system for a farmer Able to make a fertility management plan for a farmer 				
Knowledge	 Recognition and interpretation of heat signals Basic principles of artificial insemination Knowing fertility parameters and how to interpret them Familiar with basic fertility record systems 				
Attitude	Being able to help a farmer with knowledge, skills and compassion to work on improvement of the fertility status of the dairy herd				

Time in minutes	Brief Content	Role trainer/ didactical methods	Teaching aids	Role/activities Participants
40	Presenting Homework	 Discussion leader Sharing experiences 	 Manual of Breed improvement and Fertility management White or blackboard 	 Discussing Presenting Listening Making assignments
40	 Workshop Fertility Data Recording and other factors affecting fertility 	 Discussion leader Sharing experiences 	 Manual breed improvement and Fertility management White or blackboard 	 Discussing Presenting Listening Q &A
40	 Presentation record keeping 	 Presenting Q & A	 PowerPoint data recording 	ListeningQ & A
30	Break	• Dissussian	A Manual hused	• Disquesia a
40	Workshop fertility management	 Discussion leader Sharing experiences 	 Manual breed improvement and Fertility management White or blackboard 	 Discussing Presenting Listening
40	Presentation fertility management	 Presenting Q & A	 PowerPoint fertility management 	ListeningQ & A
40	Explaining afternoon assignment	Explanation program and task	Not applicable	 Listening and questioning
60	Lunch			
180	 Visit of dairy farm Observe cattle on heat signals Assessment of the fertility status of the herd (legs, body condition score, rumen fill, ration, records, etc.) Interview the farmer on how fertility management on the farm is organized 	 Guidance and coaching 	• Excursion farms	 Practice skills Fill in checklists
30	 Summary/ reflection/ homework 	 Summarize theory Discuss lessons learned and constrains experienced Give homework for next day 	White or blackboard	 Analyse findings Answering and asking questions

Lesson Matrix					
Topic / Serial #					
Practical Lesson	Day 3 Breed Improvement and Fertility Management				
Date					
Venue					
Duration	1 day/ Day 3 of the Course				
Type of students	Dairy Extension Workers				
Suggested number of students	16				
Starting situation	Students have very little or no experience with Breed improvement and Fertility Management				
<u>Outcomes</u>	The student is able to:				
Skills	 Assess fertility status of an individual cow Assess fertility status of a dairy herd Can explain to a farmer heat signals basic principles of AI fertility record systems fertility management factors affecting breed improvement and fertility management 				
Knowledge	 The participant gained knowledge on breed improvement and fertility of dairy cattle with respect how to recognize heat signals and how to interpret them. The basic principles of artificial insemination and its advantages and disadvantages compared to natural service The way how farmers can keep a record system to manage the fertility status of the herd To observe and obtain data to assess the fertility status of the herd To give management tools to the farmer how to manage and improve the fertility status of the herd 				
Attitude	Being a discussion partner and consultant for a dairy farmer in matters concerning breed improvement and fertility of the dairy herd and how to improve the fertility status of the herd.				

Time in minutes	Brief Content	Role trainer /didactical methods	Teaching aids	Role/activities Participants
45	Students prepare for presentation	Guidance and coaching	Target farms	Preparing presentation
30	Break and arrival of farmers			
15	Presentation heat signs to farmers by participant course	Listening Guiding when necessary	Power point heat signs	ListeningQ & A
15	Workshop artificial insemination by participant course	Assessing performance	 Projector/ white board/ flip overs 	ListeningAnsweringDiscussing
15	Presentation fertility data recording by participant course	Listening Guiding when necessary	Power point data recording	ListeningQ & A
15	Presentation Breed improvement and fertility management by participant course	Listening Guiding when necessary	Power point breed improvement and fertility management	ListeningQ & A
30	Coffee break			
75	Presentation of findings farm visits and recommendations to farmers	Listening Guiding when necessary Sharing experiences	Work assignments Homework results	 Listening Q & A Discussion
60	Lunch (students and farmers)			
60	Assessment result per group	Reflection on assignment results and assessment score	Discussion per group	 Reflection and discussing assessment result
60	Brain storming on farmer training	 Lead discussion and gives ideas how to train farmers in the topic 	Experiences during the Course	 Active participation in the brainstorm session
30	Evaluation of course	 Explaining evaluation form 	Evaluation form	Filling evaluation form
30	Closing	 Final Remarks Awarding certificates 	Certificates	Listening and receiving their certificate

C. Assignments

The structure of the three day course will be accordingly: In the first two days, the morning sessions will be used to gain theoretical and practical knowledge by presentations and workshops. In the afternoon this knowledge will be practised during farm visits. Due to the fact that Breed improvement and fertility management is closely related to animal health and feeding, earlier skills can /will also be practised again. At the third and final day of the module, the participants will practice their skills by presenting the knowledge they gained to the group of farmers they have visited and by informing them about the breed improvement and fertility status on their farms and by giving recommendations how to exercise farm breed improvement and fertility management.

I. Assignments first day of module

Next to the presentations on heat signals and artificial insemination there will be two workshops.

1 Workshop on importance of breed improvement and fertility management

The group leader will give an assignment to the participants of the module. The class will be divided in groups of four. The groups will be asked to find answers or give their opinion on the following issues concerning farm breeding improvement and fertility management under the local circumstances.

- Prioritize three main reasons why fertility of a dairy herd is important.
- · Mention some methods of breed improvement experiences in the locality
- List at least three outcomes of these experiences
- Make a list of five constrains affecting the fertility status on a farm.
- Make a list of five parameters or observations on a farm, which give information on the fertility status of the herd.
- Make a list of three actions (in general) a farmer can take to improve the fertility status of the dairy herd

The groups will have 30 minutes to work on the subject and afterwards the groups choose one representative to present the answers and to write down the answers on a matrix at the black or whiteboard. The outcome of the answers will be discussed plenary.

Purpose of this exercise is to get insight in the knowledge and skills of the participants on the subject and to share experiences and knowledge with each other (self education). This way it will become clear which subjects need to be prioritized during the rest of the module. It is not the intention that the group leader will immediately start with teaching and explanation to fill the gaps in knowledge. The group leader will just stress the importance or less importance of the answers given.

2 Workshop AI

Before giving the presentation on AI it will be recommendable for the group to give their knowledge and opinion about artificial insemination and to let them share knowledge and experiences. The class will again be divided in groups of four. The exercise will be: List the advantages and disadvantages of artificial insemination compared to natural service with a bull.

Let the groups discuss this for 30 minutes. The trainer listens during this time to the group discussions and keeps them on track. The groups should be different in composition according to the workshop about importance of breed improvement and fertility management.

Let one person of each group (a different one from than at the earlier workshop) present the results and discuss the results plenary followed by a presentation about artificial insemination. Purpose is again that by active participation of the participants existing knowledge about artificial insemination will be rehearsed and shared with the group.

3 Farm visits and home work day 1

Preferably divide the participants again in groups of four and let them do one or two farm visits.

Practice:

- Ask the farmer the breeding goals and method he uses on his cows
- Ask the farmer how many times he checks heat daily in practice
- Heat observation, how many cows are in heat?
- Assessment of the fertility status of the lactation cows by
 - . Doing a body condition score bad/normal/good and explanation
 - . Observing the rumen fill bad/normal/good and explanation
 - . Judging of the leg condition bad/normal/good and explanation
 - . Judging the ration of the cattle bad/normal/good and explanation

The next morning the observation and results should be discussed with all participants as following:

- Mentioning three positive points on the farmers breed improvement and fertility management
- Mentioning three points which can be changed to improve the fertility status of the herd

II. Assignments second day of module

Record keeping of breed improvement and fertility management will be the points of attention at the second day. Again skills learned at the first day and skills gained at earlier modules will be practised.

1 Workshop Fertility Data Recording

This can be done plenary, but also again groups can be made to find answers together and to share knowledge and experience. The questions to be answered will be:

- Which data will be available or should be available on a local farm to inform the farmer on the breed improvement and fertility status of the herd?
- How and where should data be recorded by the farmer to help him/her with his/her fertility management?

List the answers and discuss pro and cons for a farmer when recording data as suggested.

Purpose is for participants to share experiences and knowledges and to let them look at practical solutions. What information is essential? What is better? To write down on a stable wall or in a book or on a chart? Is the local farmer able to keep records? Is possible important data available, but never registered.

2 Workshop Breed Improvement and Fertility Management

This can be done plenary, but also again groups can be made to find answers together and to share knowledge and experience.

The questions to be answered will be:

- What are the factors afecting breed improvement and fertility management?
- What management matters can be taken to improve the fertility status of the herd?
- How can extension officers, veterinarians and feed specialists support farmers with fertility management?

Let the groups after deliberation present the results on the black or white board and discuss the results. The purpose again is to exercise to share experiences and knowledge, but also to look specifically to earlier modules like nutrition and animal health and to see to what extent this knowledge is applicable for breed improvement and fertility management.

3 Farm visits and home work day 2

The program of this afternoon is similar to day 1 but on other farms and gives special attention to record keeping and fertility management. Preferably divide the participants again in groups of four and let them do one or two farm visits. Practice:

- Heat observation
- Assessment of the fertility status of the lactation cows by
 - . Doing a body condition score bad/normal/good and explanation
 - . Observing the rumen fill bad/normal/good and explanation
 - . Judging of the leg condition bad/normal/good and explanation
 - . Judging the ration of the cattle bad/normal/good and explanation
- Look for a fertility record keeping system and assess it
- Ask the farmer specifically how he manages the fertility status of the herd by using the record keeping system.

The next morning the observation and results will be discussed with all participants and in presence of the farmers:

- Giving an overview of the observations and findings at the farm concerning fertility
- Mentioning five positive points on the farmers fertility management
- Mentioning at least five points which can be changed to improve the fertility status of the herd
- Suggest a way how to record fertility data

Make a report of maximum three pages on A4 or a PowerPoint of maximum ten slides.

III. Assignments last day of the module

First the participants will prepare their presentations.

- Four participants will give a general and short introduction to farmers on the topics
 - . Breed improvement
 - . Heat signs
 - . Artificial insemination
 - . Record keeping
 - . Fertility management

This way the knowledge of the participant on the subjects can be assessed and his capacity to communicate with the farmers. Next to this the homework of day 2 will be presented to the farmers and discussed with them.

D. Assessment:

- Each group receives a group score for their report.
- Each group member receives an individual score for their individual presentation.
- Assessment results will be discussed with the groups after lunch.
- For the used assessment forms see annex 1 and 2 of this assignment.

